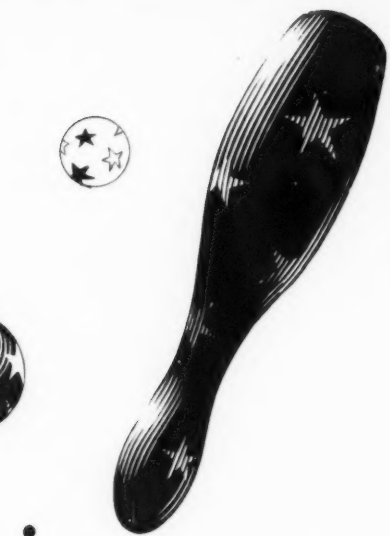
L 1959

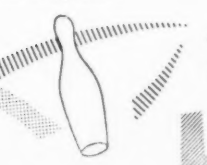
NDUSTRY

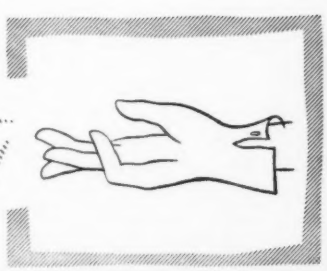
N-FERROUS METALS



lation

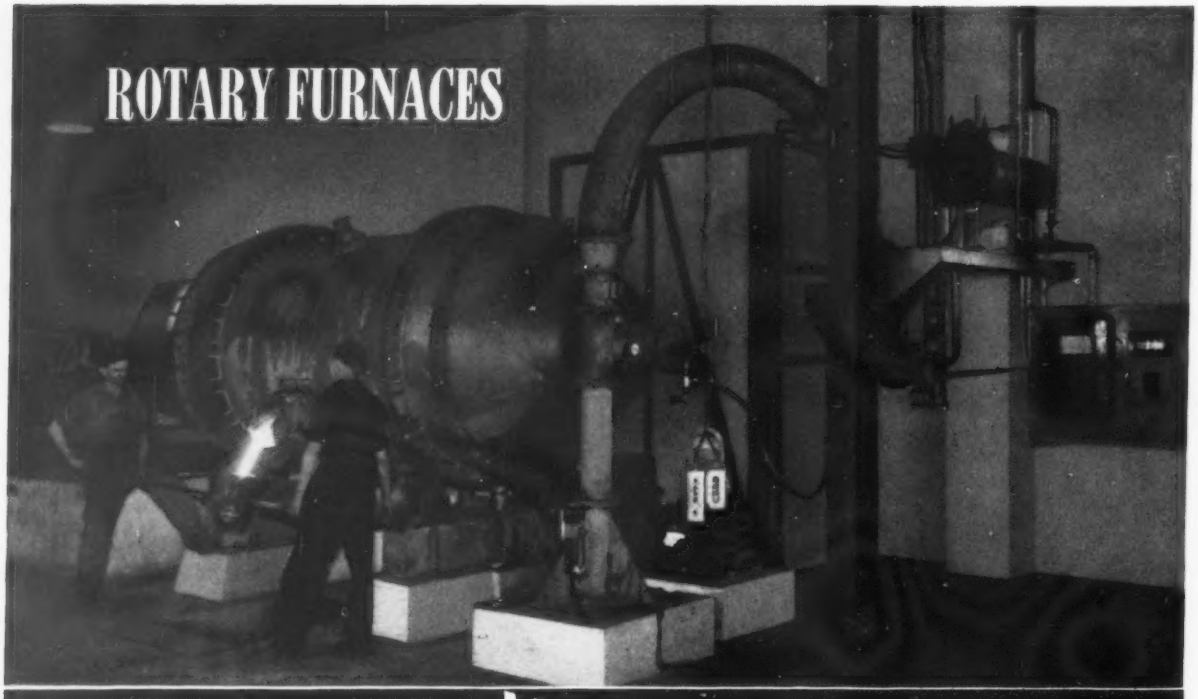
ngenuity also
art in modern
ques. If your
n problems
d unequalled
etal fabrication
Camelinat.
nd complete





MELINAT & CO., LTD.,
STREET, BIRMINGHAM 1
al 6755 (5 lines) Grams: Camelinat, Birmingham

ONE SHILLING



USED FOR REFINING ALUMINIUM, COPPER, BRONZES, GUNMETALS, BATTERY PLATES, LEADS, SCRAP SWARF AND RESIDUES.

MONOMETER MANUFACTURING CO. LTD.,
SAVOY HOUSE 115-116 STRAND, LONDON, W.C.2. Telephone: TEMple Bar 9025

Get the Best

from

Aluminium

Casting Alloys

With the help of our free technical advisory service

ASSOCIATION OF LIGHT ALLOY REFINERS AND SMELTERS
3 ALBEMARLE STREET, LONDON, W.1.
Telephone: MAYFAIR 2901

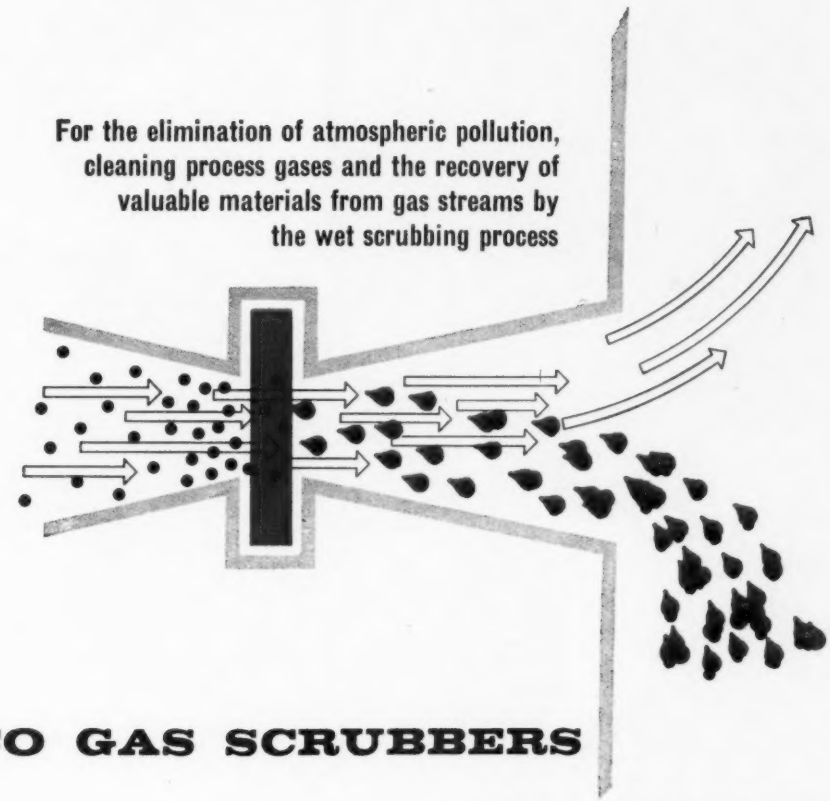
for a Good Finish

HOT BRASS PRESSINGS
for GAS, WATER and ELECTRICAL FITTINGS and GENERAL ENGINEERING TRADES

by

ASSOCIATED PRESSINGS LIMITED
SPRINGCROFT ROAD, BIRMINGHAM 11

For the elimination of atmospheric pollution, cleaning process gases and the recovery of valuable materials from gas streams by the wet scrubbing process



CHEMICO GAS SCRUBBERS

FOR INDUSTRY

Typical applications include:

Blast Furnace
Oxygen Steel Converter
Open Hearth Furnace
Cupola
Electric Furnace
Non-Ferrous Smelting
Crushing and Screening
Coke Oven Gases
Rotary Kiln
Foundry Shake-Out
Sintering Plant
Plant and Pickling

Technical advice and illustrated literature on request.

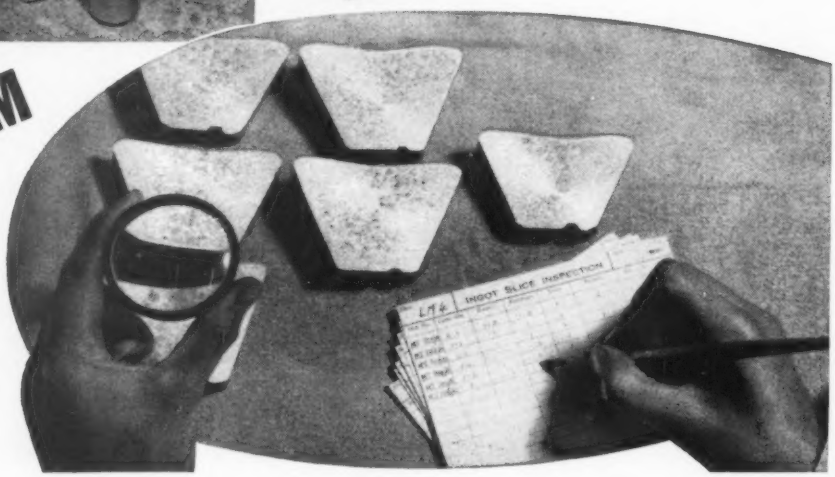
CHEMICO

CHEMICAL CONSTRUCTION (G.B.) LTD. 9 HENRIETTA PLACE, LONDON W.1
LANGHAM 6571

A

QUALITY...

UNIFORM



Intensive Research and Quality Control ensure that you can depend on the uniformity of

Unceasing research and strict quality control, at all stages of production, ensures that Intal Light Alloy Ingots can always be depended upon. The quality never varies. With over a quarter of a century's experience and progress, Intal maintain all the newest techniques in scientific inspection, and make use of the most advanced instrumentation in ensuring that the Intal high standard of quality is consistently maintained.

INTAL

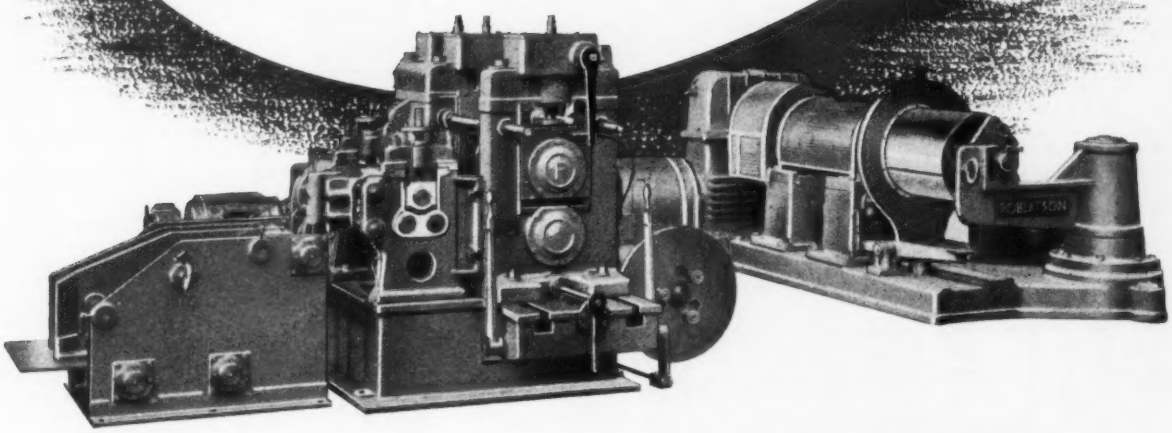
Light Alloy Ingots

These illustrations are taken from the latest Intal booklet, giving much interesting information on alloy ingot manufacture. We shall be pleased to post a copy to executives on request.

INTERNATIONAL ALLOYS LTD

HAYDON HILL, AYLESBURY, BUCKS. Telephone: Aylesbury 4242. Telex. 15/520 Cables: Intalloyd, Aylesbury

ROBERTSON
SLITTING
MACHINES



A range of machines up to 60″ wide with cutters from 4″ to 18″ dia.

for working on pull-through or power drive in steel or non-ferrous

metals at speeds up to 500 feet per minute.

W. H. A. ROBERTSON & CO. LTD. • BEDFORD • ENGLAND

LICENSEES FOR THE BUILDING OF SENDZIMIR COLD REDUCTION MILLS & PLANETARY HOT MILLS & THE HALLDEN GUILLOTINE & ROTARY FLYING SHEAR MACHINES & TORRINGTON WIRE FLATTENING & EDGING MILLS. W.T.315

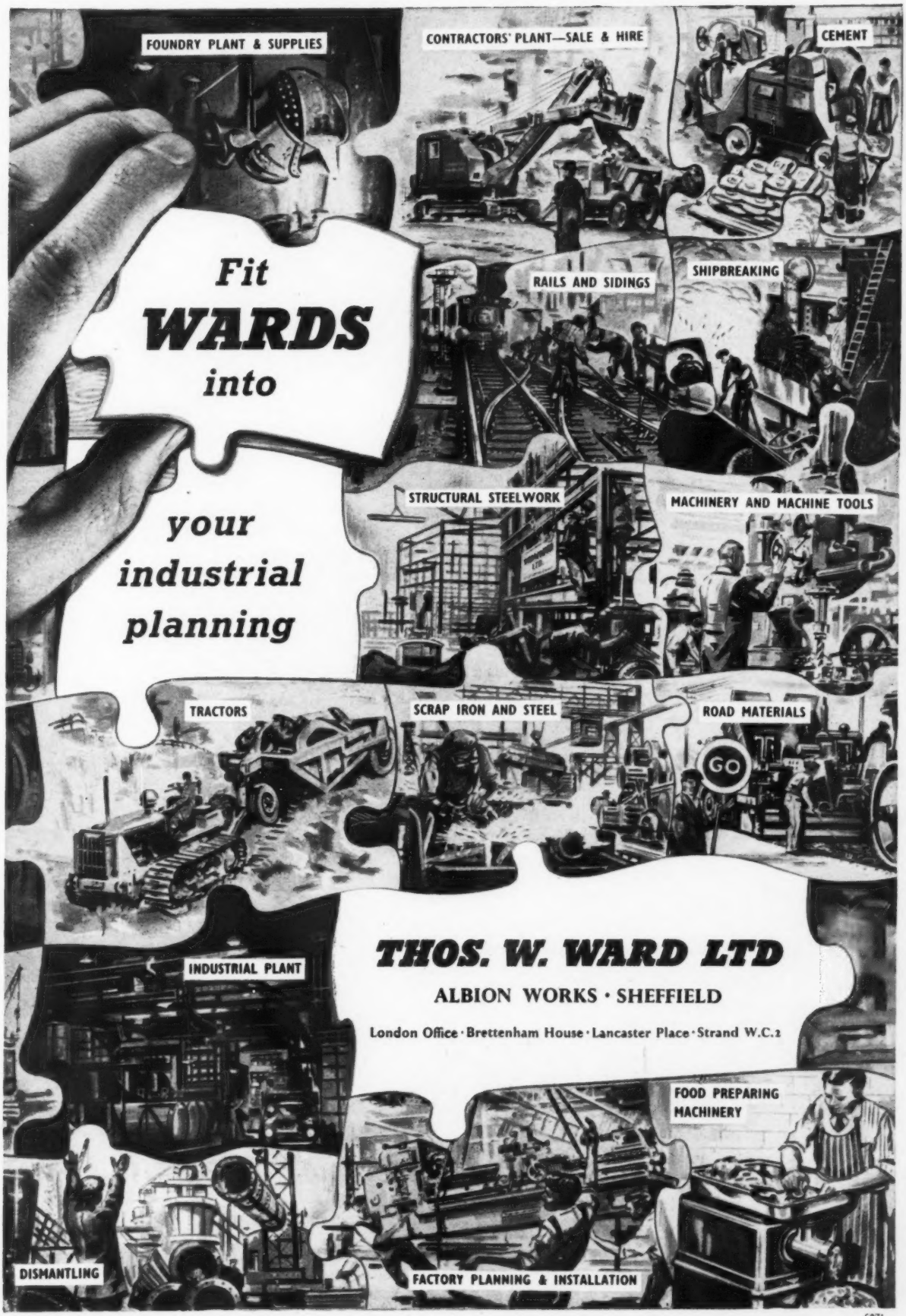
VITREOSIL

. . . devilish
good
acid heating

Do you accept waste with a devil-may-care shrug . . . or do something about it with Vitreosil Electric immersion heating? Controlled immersion heating in the electro-plating or pickling bath costs less, saves time, and improves output. *Like more information?* Write and we'll be devilish quick in replying!

VITREOSIL
electric
IMMERSION HEATERS

THE THERMAL SYNDICATE LTD.
P.O. Box No. 6, WALLSEND, NORTHUMBERLAND.
Telephone: Wallsend 6-3242
LONDON: 9, BERKELEY STREET, W.1.
Telephone: HYDe Park 1711/2


FOUNDRY PLANT & SUPPLIES
CONTRACTORS' PLANT—SALE & HIRE
CEMENT
Fit
WARDS
into
your
industrial
planning
RAILS AND SIDINGS
SHIPBREAKING
STRUCTURAL STEELWORK
MACHINERY AND MACHINE TOOLS
TRACTORS
SCRAP IRON AND STEEL
ROAD MATERIALS
GO
INDUSTRIAL PLANT
THOS. W. WARD LTD
ALBION WORKS · SHEFFIELD
London Office · Brettenham House · Lancaster Place · Strand W.C.2
FOOD PREPARING MACHINERY
DISMANTLING
FACTORY PLANNING & INSTALLATION

SURFORM Block Plane

STREBOR DIE-CASTINGS

SURFORM Convex Plane

are used in

SURFORM

PLANES & FILES

SURFORM is a Registered Trade Mark of Simmonds Aerocessories Ltd.

More and more firms up and down the country are discovering that Strebor die-castings meet the highest standards of precision.

Another job successfully carried out by STREBOR.

STREBOR

DIE CASTINGS

ZINC BASE, ALUMINIUM, MAGNESIUM, FULL DESIGN AND TOOL MAKING FACILITIES AVAILABLE.

STREBOR DIE-CASTING CO. LTD., WINDLEY WORKS, RADCLIFFE, LANCS. Phone: Radcliffe 2661 Telex No. 66-305

ST. 11

CUSTOMERS OF CARBORUNDUM

"These pots are good for 180 heatings at least", says **Alf Hawkins**

Alf Hawkins is Foundry Foreman of S. Booth & Sons, Birmingham—a family business, founded in 1805, and probably one of the world's oldest-established plumbers' Founders. Alf has been with Booths over 30 years—so he speaks with authority. "These Carborundum crucibles," says Alf, "conduct heat better—that means quicker melting. And the most important thing about Carborundum is this: I reckon their pots are good for 180 heatings at least. That's five or six times what we got with the old clay-bonded pots. The men in my team get used to handling a pot—and the less often you have to change, the speedier we can work. Carborundum helps to keep up the pace!"

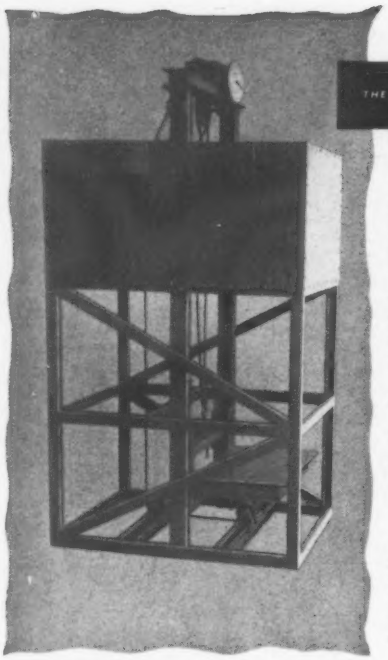
CARBORUNDUM can help YOU

Alf Hawkins knows what he's talking about—and in almost all the world's major industries there are men who talk about us as Alf does. They'll tell you that CARBORUNDUM help them make better products, cut costs, and speed production. In the battle for expanding markets overseas, high quality, low price, and early delivery dates are vital for victory. There are rich prizes for those who can meet the challenge. Abrasive and refractory products by CARBORUNDUM can help *you* to win them.

Products by **CARBORUNDUM** cut your costs

TRADE MARK

THE CARBORUNDUM COMPANY LIMITED, TRAFFORD PARK, MANCHESTER. *Tel: Trafford Pk. 2381*



THE **RUSCOE TURNER** SEMI CONTINUOUS **CASTING MACHINE**

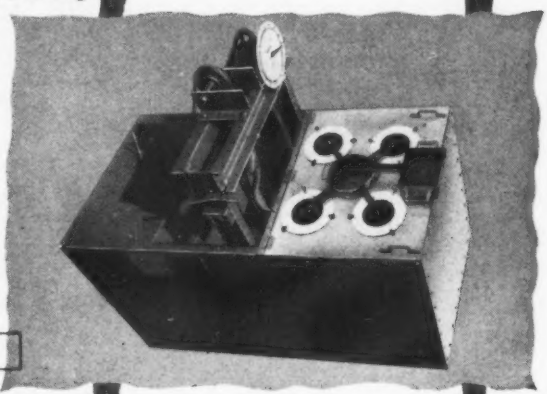
CASTING CAPACITY

The die moulds, each 3 in. to 4 in. long are arranged for water-cooling and are carried on a hinged table on the upper platform of the machine. Billets can be cast as follows: up to 24 in. dia. by 10 ft. long can be cast singly. Two billets simultaneously up to 15 in. dia. Four billets from 6 in. to 12 in. Six billets up to 6 in. dia. Rolling slabs from 1 to 5 according to size required.

Patent Nos.,
British
617499 - 733913 - 19288/53.
Canadian
646220
Australian
19997/53.

Produces the highest quality billets. Maintenance costs practically nil. We can supply with machine Die Moulds, Pouring Box and Distributors.

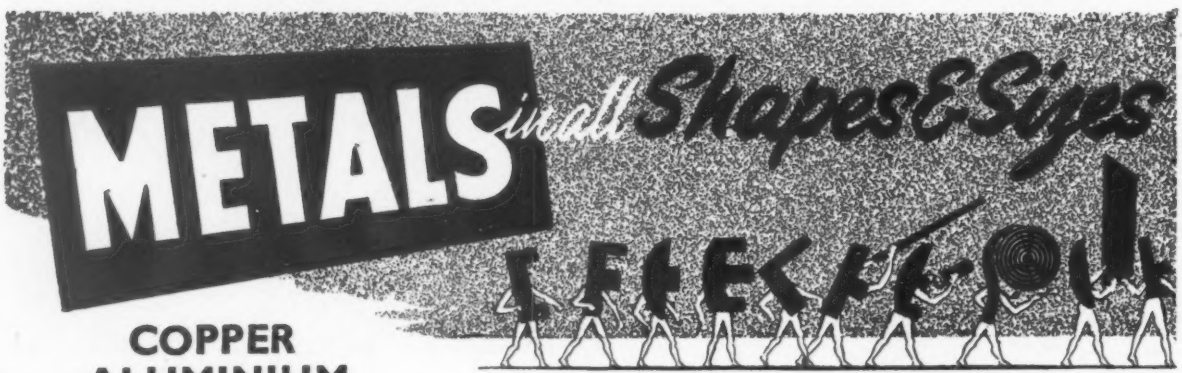
- ★ Small Excavation Cost
- ★ Completely New Method
- ★ Low Running Cost
- ★ Cheapest and most reliable means of Semi-Continuous Casting.



ROLSAN ENGINEERING LIMITED

82, FREDERICK ROAD, SELLY OAK, BIRMINGHAM 29
TELEPHONE: SELLY OAK 3319

DELIVERED FROM STOCK OR TO YOUR ORDER



COPPER
ALUMINIUM
& LIGHT ALLOYS

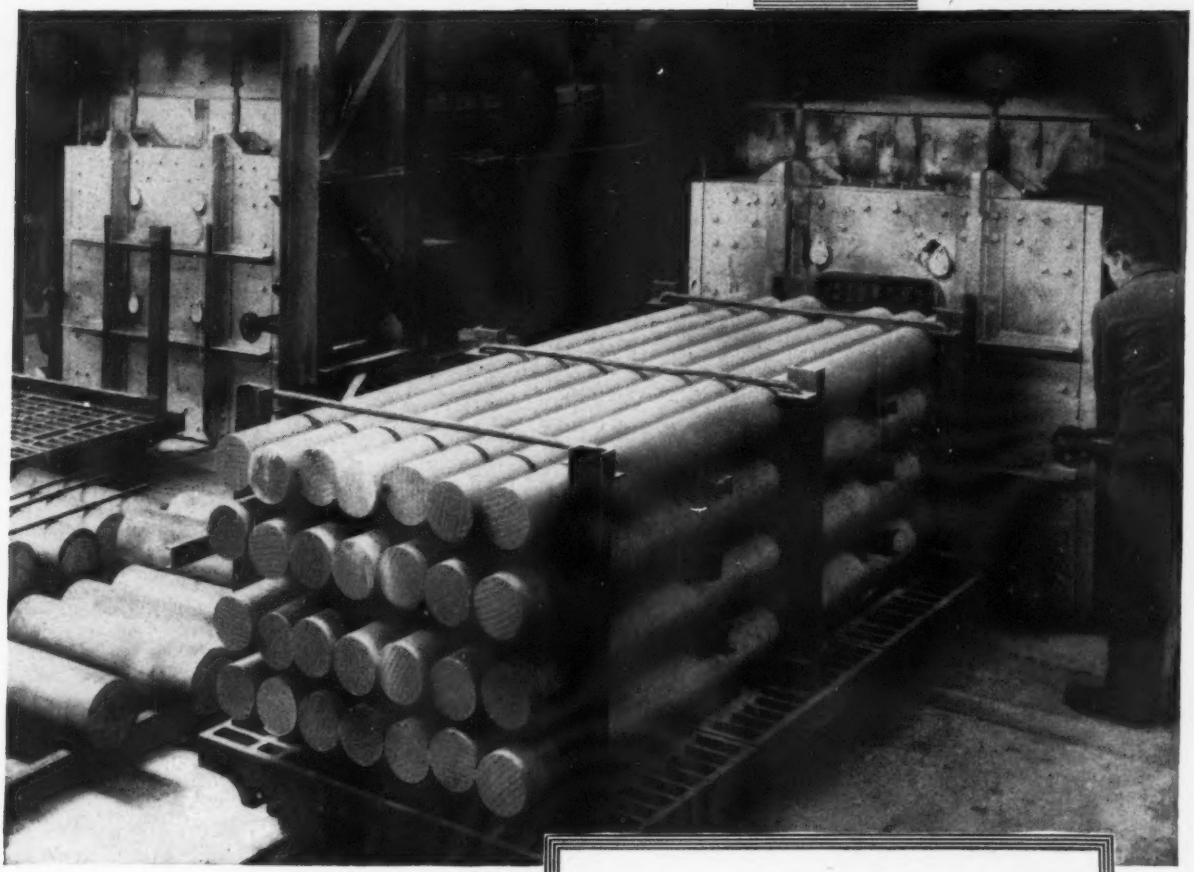
BRASS TURNING RODS
$\frac{1}{16}$ to 8 ins.
TUBES · SHEETS · WIRES · FLAT
HEXAGON · SQUARE RODS
IN BRASS · PHOSPHOR
BRONZE

Screws · Rivets and Small Machined Parts
Maxwell Frames

T.W. SENIER
& CO. LTD.
115-121, ST. JOHN ST.
LONDON, E.C.1.

Phone: CLErkenwell 5937 Grams: DAUNTING LONDON

SHEARING & GUILLOTINING TO CUSTOMERS ORDERS



By kind permission
Messrs. Reynolds T.I. Aluminium Co. Ltd.

TWO DIRECT GAS-FIRED CONVECTION TYPE FURNACES WITH HIGH SPEED RECIRCULATING FANS FOR HOMOGENISING ALUMINIUM BILLETS

GIBBONS

GIBBONS BROTHERS LTD

P.O. BOX 19, DIBDALE · DUDLEY · WORCS

Telegrams: "Gibbons, Dudley". Telephone: Dudley 3141 *(P.B.X.)*

Sign of RS *Service*

ANODISING

A.I.D., A.R.B., and I.A. Approved

CHROMIC and SULPHURIC ACID PROCESSES
DECORATIVE SILVER ANODISING work of exceptionally long dimensions—A SPECIALITY
24-hour service on repetition work. Free collection and delivery.

ELECTRO-PLATING in Chrome, Nickel, Copper, Cadmium, Zinc, Silver, etc. Chromating, Phosphating & all other processes.
STOVE ENAMELLING. Cellulose Paint Spraying & Sand Blasting.

ROBERT STUART (LONDON) LTD.
ASCHAM STREET, KENTISH TOWN, LONDON, N.W.5 • TEL: GULLIVER 6141/2/3

ALUMINIUM
TO ALL SPECIFICATIONS
ILFAR ALUMINIUM Co. Ltd
CANLEY, COVENTRY — Phone: 3673
ALLOY INGOTS

GORDON SIMPSON
(ASSAYER) LIMITED
ANALYTICAL CHEMISTS
ASSAYERS AND SAMPLERS
On Metal Exchange List of Assayers and Samplers
LABORATORIES AND ASSAY OFFICES
191 CLAPHAM ROAD, LONDON, S.W.9
Phone: BRIxton 1671

Metal Finishers

HARD CHROME
HEAVY NICKEL
Deposition BARREL PLATING
Firma CHROME LIMITED
66-72, EYRE ST. SHEFFIELD · 1
Telephone: 26771-2 Telegrams: PHONE 26771-2

FOR ALL—
METAL finishes
The HARRIS PLATING WORKS Ltd
A.I.D. REGD. No. 158079/31.
AIR REG. BOARD AUTHY. No. A1/1268/39
D.I.ARM APPROVED No. IA/42/5/260
18 NEW WHARF ROAD, LONDON, N.1.
Telephone: TERMINUS 7263/7

Heavy Electro Deposition of Chromium, Nickel and Copper by
FESCOL
Established 1920
is now available at
London · Port Glasgow · Huddersfield
Brownhills, Staffs.
FESCOL LTD. · NORTH ROAD · LONDON N.7
NORTH 3025 TGA F43

COST ACCOUNTING AND THE ENGINEER
By KENNETH B. MITCHELL,
A.C.W.A., AFF. I.W.M.

This book sets out to explain cost accounting and how it operates to the engineer on the shop floor. The approach is simple and direct, the reader being shown in a practical manner how modern cost accounting influences every department. Special attention is given to problems of budgeting and budgetary control.

10s. 6d. net. By post 11s. 4d.

Obtainable from booksellers, published by:

Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1

HANDBOOK OF INDUSTRIAL ELECTROPLATING
E. A. Ollard, A.R.C.S., F.R.I.C., F.I.M., and E. B. Smith

Facts, figures and formulæ for all who design, erect, maintain or operate electro-deposition plant, and for laboratory workers who deal with plating solutions. Includes sections on water and drainage purifications of solutions, storage and handling of chemicals and plating-shop costing.

35s. 0d. net. by post 36s. 5d.
from all booksellers or Iliffe & Sons Ltd., Dorset House, Stamford Street, S.E.1.

METALLURGICAL PROGRESS

One of the most time-consuming tasks for advanced metallurgical students and research workers is "Searching the literature." This 3rd edition does this task brilliantly and comprehensively. 6s. 0d., post free.

From all booksellers, published by
Iliffe & Sons Ltd., Dorset House, Stamford Street
London, S.E.1.

Skill and Experience . . .

. . . in age old crafts are part of Britain's heritage, and the basket maker following his traditional trade is still to be found in the country to-day.

We, too, are proud of our skill and experience based on nearly 200 years of working in precious metals. From this experience we are providing industry with the "Thessco" range of silver solders and brazing alloys suitable for the joining of most metals.

Our skill and experience is at your disposal. Write for our latest leaflets or ask for one of our technical representatives to call for a full discussion

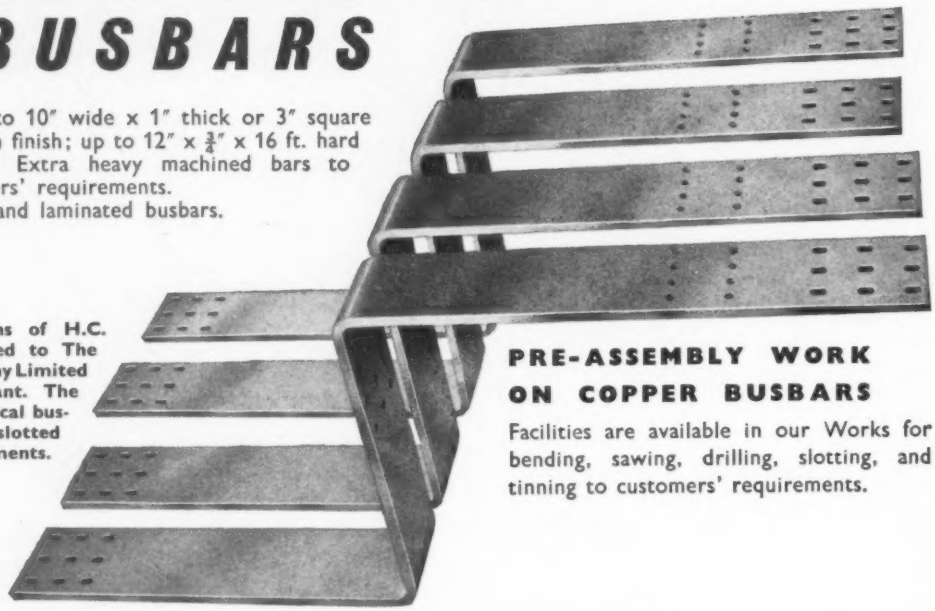
The **SHEFFIELD SMELTING Company Limited**

HEAD OFFICE AND WORKS : ROYDS MILL STREET, SHEFFIELD 4

ALSO AT LONDON AND BIRMINGHAM

BOLTON'S H. C. COPPER BUSBARS

Up to 10″ wide x 1″ thick or 3″ square drawn finish; up to 12″ x ¾″ x 16 ft. hard rolled. Extra heavy machined bars to customers' requirements.
Tubular and laminated busbars.



Approximately 400 tons of H.C. Copper Busbars supplied to The Associated Ethyl Company Limited for their Chlorine Plant. The illustration shows a typical busbar bent, drilled, and slotted to customer's requirements. Section 8″ x ¾″.

PRE-ASSEMBLY WORK ON COPPER BUSBARS

Facilities are available in our Works for bending, sawing, drilling, slotting, and tinning to customers' requirements.

THOMAS BOLTON & SONS LTD
Head Office: Mersey Copper Works, Widnes, Lancs. Telephone: Widnes 2022
London Office & Export Sales Dept:
168 Regent Street, W.1. Telephone: REGent 6427

CVS-5243

Flawless

No, we shall not be silly and claim that our castings are as flawless as a piece of 16th century Venetian Glass. But we can go this far: we can say that just as the old master craftsmen got great satisfaction out of doing a job as well as it could possibly be done, so do we. That is why so many customers whose castings must have a fine skin which will readily anodise put their trust in Great Bridge Foundries

PRECISION CASTINGS IN ALUMINIUM, GUN METAL, GREY IRON, ETC. TO ALL SPECIFICATIONS

Phos. bronze and gun metal solid and cored sticks always in stock

THE GREAT BRIDGE FOUNDRY CO. LTD.

Sheepwash Lane Great Bridge - Tipton
Staffordshire Telephone: TIPton 2914/5/6

A Member of the Triplex Foundries Group

THE SIGN OF A GOOD CASTING

Q88

METALLICS RECLAIMED
FROM YOUR ALUMINIUM SKIMMINGS & DROSS

Your slags, skimmings and drosses are valuable. Tame Valley Alloys effect the maximum extraction of metallics, returning them to you either as metallics ready for melting, or as ingot covered by certified analysis.
You can use them with absolute confidence knowing that they are uncontaminated with other materials, and are strictly to analysis.

Tame Valley Alloys collect, refine, and re-deliver at an inclusive charge per ton of residue, or a charge for residue treated and metallics melted—or we buy outright.

Write for full details.

—returned to you ready for melting

by TAME VALLEY ALLOYS reclamation service

TAME VALLEY ALLOYS LTD., WILNECOTE, Nr. TAMWORTH, STAFFS. Tel. Tamworth 1151

Have you ordered your extra copies?

Every department in every firm, manufacturing, using or dealing in non-ferrous metals should have a copy of METAL INDUSTRY HANDBOOK AND DIRECTORY for instant reference. Don't make do with the one copy sent to you as a "Metal Industry" subscriber—extra copies are essential if your whole organization is going to obtain maximum benefit from the wealth of data and information on all aspects of non-ferrous metals. Sections cover: general properties of metals and alloys: general data and tables: electroplating and allied processes: directory of trade names and associations: buyers' guide directory.

METAL INDUSTRY HANDBOOK AND DIRECTORY 1959

CONTENTS

Section I
General properties of Metals and Alloys

Section II
General Data and Tables with Prices of Metals Table

Section III
Electroplating and Allied Processes. Useful Tables, Common and Chemical Names and Formulae

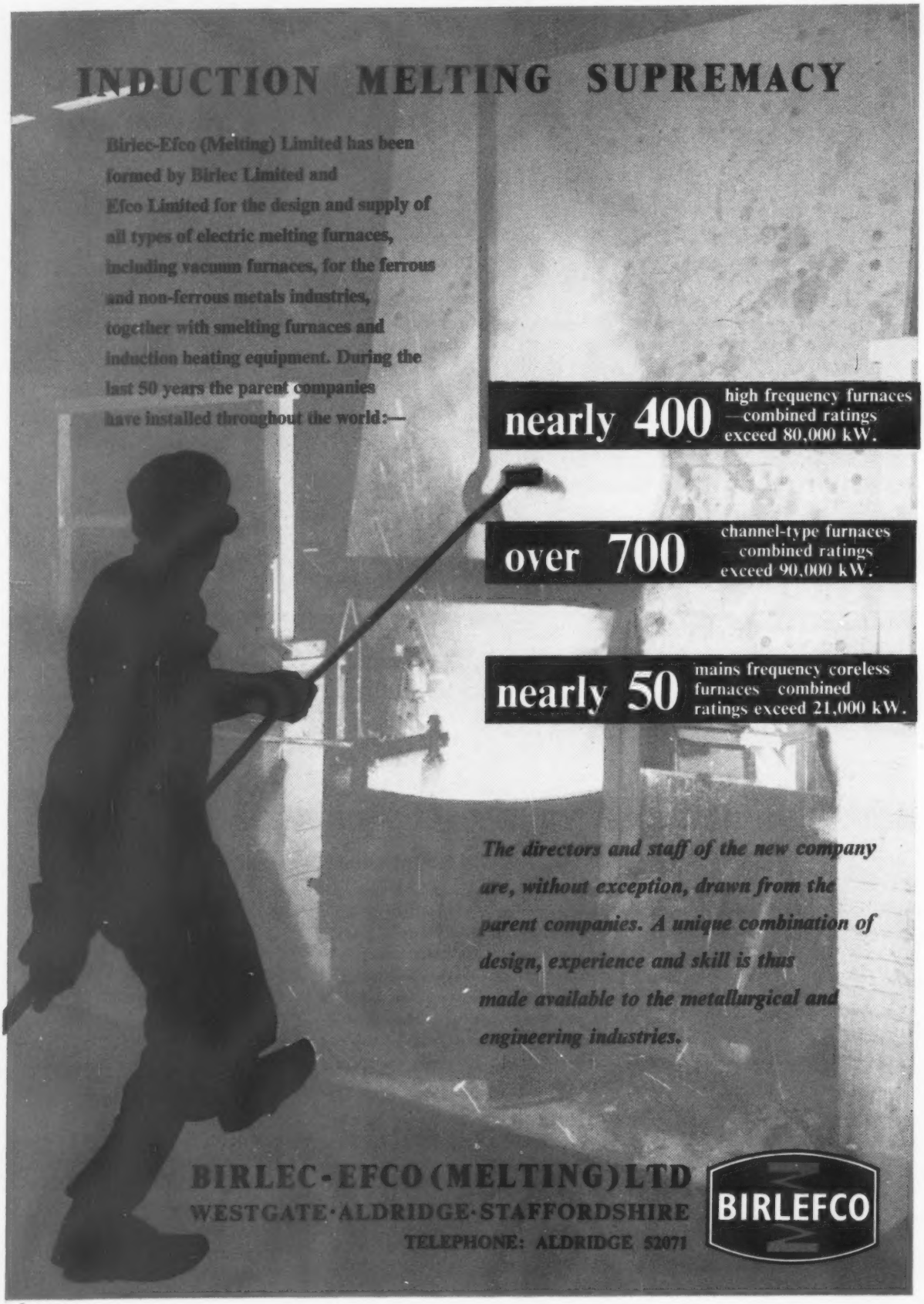
Section IV
Directory of Associations and Institutions, Buyers' Guide, List of addresses, Index to Advertisements

48th Edition
8½" × 6" 586 pages

One FREE copy sent direct to all "Metal Industry" subscribers

Extra copies
21s. net, by post 22s. 9d.

"METAL INDUSTRY," DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.


INDUCTION MELTING SUPREMACY
Birlec-Efco (Melting) Limited has been formed by Birlec Limited and Efco Limited for the design and supply of all types of electric melting furnaces, including vacuum furnaces, for the ferrous and non-ferrous metals industries, together with smelting furnaces and induction heating equipment. During the last 50 years the parent companies have installed throughout the world:—
nearly 400 high frequency furnaces —combined ratings exceed 80,000 kW.
over 700 channel-type furnaces combined ratings exceed 90,000 kW.
nearly 50 mains frequency coreless furnaces combined ratings exceed 21,000 kW.
The directors and staff of the new company are, without exception, drawn from the parent companies. A unique combination of design, experience and skill is thus made available to the metallurgical and engineering industries.
BIRLEC-EFCO (MELTING) LTD
WESTGATE·ALDRIDGE·STAFFORDSHIRE
TELEPHONE: ALDRIDGE 52071
BIRLEFCO

SM/BE441

METAL INDUSTRY

FOUNDED 1909

EDITOR: L. G. BERESFORD, B.Sc., F.I.M.

17 APRIL 1959 VOLUME 94 NUMBER 16

CONTENTS

	Page
Editorial: Keeping Ahead	301
Out of the Melting Pot	302
Finishing Supplement: Surface Treatment of Aluminium *By F. Flusin*	303
Precision Barrel Finishing	305
Atomic Progress: Magnesium Canning	306
Protection and Packaging of Non-Ferrous Metals	307
British Engineering Products: Engineering, Marine, Welding and Nuclear Energy Exhibition	310
Industrial News	314
Parliamentary News	315
Forthcoming Meetings	315
Men and Metals	315
Metal Market News	316
London	
Birmingham	
New York	
Buenos Aires	
Zurich	
Oslo	
Non-Ferrous Metal Prices	317
Scrap Metal Prices	318
Foreign Scrap Prices	319
Financial News	319
New Companies	319
Light Metal Statistics	319
The Stock Exchange	320

© Iliffe & Sons Ltd. 1959

Permission in writing from the Editor must first be obtained before letterpress or illustrations are reproduced from this journal. Brief abstracts or comments are allowed provided acknowledgment to this journal is given

PUBLISHED EVERY FRIDAY BY ILIFFE & SONS LIMITED

Editorial Offices: 9 Charlotte Street, Birmingham 3 . Telephone: Central 3206

Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Tel.: Waterloo 3333. 'Grams: "Metustry, Sedist, London"

Branch Offices: MANCHESTER: 260 DEANSGATE, 3; telephone, Blackfriars 4412 and Deansgate 3595. BIRMINGHAM: KING EDWARD HOUSE, NEW STREET, 2; telephone, Midland 7191. COVENTRY: 8-10 CORPORATION STREET; telephone, Coventry 25210. GLASGOW: 26a RENFIELD STREET, C2; telephone, Central 1265

ANNUAL SUBSCRIPTION

HOME **£3 7s. 6d.** *OVERSEAS* **£3 12s. 0d.** *CANADA AND U.S.A.* **$10.00**

INCLUDING ONE COPY OF **METAL INDUSTRY HANDBOOK,** *PUBLISHED ANNUALLY*

We have the answers to your corrosion problems at our finger tips

C-SENTRY ZINC ALLOY ANODES
The modern, economic and efficient method of protection of steelwork against sea water corrosion. Easy to fit, using cast-in steel inserts. Special paint systems are unnecessary. Anodes are supplied ready for fitting. A comprehensive range of sizes is available.

ZINC COATINGS
Protective zinc coatings may be applied inexpensively to steel by hot-dip or electro-galvanising, spraying or sherardizing. Zinc affords durable envelope protection by its high resistance to corrosion plus sacrificial protection to prevent rust at any bared areas.

DELAVILLE SUPERFINE ZINC DUST
For protective paints; the uniformity of particle size and absence of coarse particles give paints good appearance and perfection of finish. Zinc-rich paints can be applied as film with sufficient thickness to confer a high degree of protection when used as a one-coat shop primer.

ORR'S ZINC TETROXY CHROMATE
For incorporation in priming paints for steel and light alloys. The soluble chromate ions released in the presence of moisture suppress anodic corrosion. Since the chromate availability is both low and uniform, primers containing Z.T.C. have long and effective protective life.

ZINC DUST/ZINC OXIDE
Priming paints containing 80% of zinc dust and 20% of zinc oxide by weight produce a high performance corrosion inhibitor for industrial and marine environments. An advantage of this primer is that only a very limited surface preparation is necessary.

Visit us at stand nos. 48/49 at the Corrosion Exhibition and let us give you a helping hand in your fight against corrosion

CONSOLIDATED ZINC CORPORATION (SALES) LIMITED · 37 DOVER STREET · LONDON W.1

METAL INDUSTRY

VOLUME 94 NUMBER 16 17 APRIL 1959

Keeping Ahead

ALTHOUGH there can be no doubt that this country is well to the fore as far as primary inventions are concerned, and also in the field of processing metals, we are rather inclined to hide our light under a bushel so that more often than not others claim the credit. An instance of this is cited by "Skimmer" in this week's issue where, with much flourish of trumpets, an American firm claims a "breakthrough" in the processing of tungsten whereas the methods have been in use in this country for some time past.

Reticence apart, however, are we, as a nation, inclined to be complacent about our developments, and, in particular, about our ability to hold our own in the subsequent race to produce equipment and processes to enable the commercialization of original research to be achieved? There are, indeed, a number of indications that this is so, and all too frequently enquirers after a particular piece of process plant or machinery are referred to an American or Continental manufacturer as the only source of supply. A recent reference to this state of affairs was made at the Sheffield works of Jessop-Saville Limited on the occasion of the showing to the Press of two furnaces for special alloys. One of these, a Heraeus consumable arc electrode melting furnace for the production of titanium, zirconium and some high-alloy steels, was of German design and manufacture; the other, a vacuum induction furnace, though built by the British firm Wild-Barfield, is of American design. According to the speaker, no comparable furnaces of British design and manufacture were available when the installation of these furnaces was contemplated.

How far does this situation prevail in the wider field of the non-ferrous metals industry generally? It is true, certainly, in the field of large die-casting machines, where all the largest machines operating in this country are of Italian, Polish or American design. It is also true of the very small, fully automatic die-casting machines which produce minute castings at a very high rate. Another instance that springs to mind is that of the Properzi process, which appears to have no comparable equivalent in the purely British market. Where, also, is the British counterpart of the automatic tube forming and welding machine described on page 211 of our issue of 13 March this year. On the other side of the picture we can, of course, cite developments in the atomic energy field which have placed this country to the forefront in the export of packaged nuclear power stations, or, as a lesser instance, the totally enclosed rolling mills for special metals described in METAL INDUSTRY, on page 376, 31 October 1958, which are ahead of the designs, of American origin, on which they are based.

Can we, however, afford to be completely satisfied when surveying the industrial field at large, where it would appear that the number of major items of process equipment in which we have a unique manufacturing claim is far too small? It may be argued that the difficulties of selling British-built plant in, for instance, the dollar market have compelled manufacturers to sell or license their rights, rather than build the equipment themselves. It may also be argued that many original British ideas have not been successfully exploited over here because of financial difficulties. It may, indeed, be true that the complex patent situation prevents many sound ideas from being developed. But while all these arguments may well have considerable validity as explanations of why we are not producing particular industrial equipment, they will not help us to maintain the lead that we have had in the past over our competitors, nor even to keep level with them. As there is little indication that the pace is slackening, are we being too complacent?

Out of the MELTING POT

Comments on Novelty

NOVELTY is by no means the only, or even the most important, criterion used in selecting subjects for paragraphs appearing on this page. Others include originality—a much more meritorious attribute than formal novelty—the ability to undergo the process of condensation without suffering loss of identity and sense, and that indefinable quality of interest, general or otherwise. Besides, novelty is, in most cases, only relative. Indeed, the absence of a certain degree of novelty may on occasion prove profitable. An excellent example of this is provided by the mention (this page, METAL INDUSTRY, 30 January 1959, p. 82) of American work in which the electron microscope was used for the direct observation of dislocations and of their behaviour in thin films, which mention resulted in my attention being drawn (unfortunately without actual references to the literature) to much earlier pioneering work of this kind in this country (METAL INDUSTRY, 6 March 1959, p. 188). Again, absence of a firmly established claim of novelty may provide an occasion for surprised comment. This is possible, for example, in the case of the "major breakthrough" in the fabrication of tungsten recently announced in America. This, it appears, has made possible the forging, extrusion and even deep-drawing of the metal. The surprised comment in this case is likely to be caused by the discovery that the novelty of the "breakthrough" resides in heating the tungsten to a temperature at which it can be hot worked, and in the use of tools of tungsten carbide heated to avoid heat loss from the work. Other comment on the same "breakthrough" by a firm in this country is that: "We find all this very amusing as we have been fabricating tungsten in most of the forms they detail for some time now. In particular, we have been producing spinnings of tungsten which, incidentally, have caused very considerable interest in America." There certainly seems to be a case for less novelty and more comment.

Direct Approach

APART, of course, from the possible operation of a law of the conservation of ignorance, it should very soon now become easier to consider what is still unknown than the knowledge already acquired. A law of the conservation of ignorance would mean that ignorance can never be destroyed: advancing knowledge merely causing a transfer of the ignorance. However, fortunately or unfortunately, depending on the standpoint adopted, the transfer of ignorance would also seem to be accompanied by some fundamental change in the nature of ignorance that makes it more and more difficult to shift. Where formerly simple means and methods were sufficient, large, elaborate and costly equipment, and advanced methods of evaluating the experimental results, are nowadays usually required to remove ignorance from one of its strongholds. It would be by no means improbable for ignorance ultimately wholly to become reduced to a state in which it will no longer be accessible to the methods as we know them to-day, or any possible developments, extensions and refinements of them. Needless to say, this state of affairs will be described, as is already being done here and there, as one of uncertainty: an impressive way of saying we do not know and have no hope of ever finding out. But to return to our starting point: would it now be easier to consider what is still unknown rather than the knowledge already acquired. If, as has been suggested, ignorance is becoming more and more inaccessible, the answer to this question must be very much in the affirmative. Action in accordance with this conclusion presupposes the adoption of a positive and, above all, a much more realistic point of view in regard to the unknown and the unknowable. It would presuppose the development of methods not of finding out, but of finding out whether it is, in fact, possible to find out; and it would presuppose the willingness ultimately to put up "No through road" signs along certain avenues of advance and leaving them at that. Action along these lines would, however, provide a welcome alternative to the present procedure of approaching the unknown through what one hopes is a comprehensive survey of the known.

Out of Hand

READERS who may have been moved by my paragraph on metal-plastics combinations (this page, METAL INDUSTRY, 10 April 1959, p. 282) to spare a thought to the possibilities of such compositions would be well advised, before proceeding any further, to enlist the help of somebody with chemical qualifications. Not only will this ensure safe progress through the unavoidable polysyllabic nomenclature, but it will also provide the very desirable attitude of a chemist to metals as chemical elements, to supplement the metallurgist's attitude to metals as almost purely physical solids. Although certainly desirable, this chemical attitude may on occasion prove somewhat disturbing. Thus, the chemist may even go so far as to suggest the production of metals by chemical means as and when required, without apparently realizing the need for the proper functions, in this connection of a metallurgist or a powder metallurgist, as the case may be. An instance of this is to be found in a process for the production of polymeric material containing a dispersion of metal particles. Instead of, as it were, going through the usual channels and starting with the polymeric material and a metal powder, the process starts with a polymeric material which performs the dual function of a reducing agent for metal compounds and a supporting medium for the reduced metallic particles. Specifically, an aqueous solution of a polyvinyl alcohol containing 1 to 15 per cent of a chloride, sulphate or nitrate of copper, silver or iron, is heated to remove the water, and the remaining mixture is then heated at 75°-200°C. to reduce the metallic compound and thereby produce a dispersion of metal particles in the solid polymeric material. The resulting products are tough, coherent and self-supporting, and insoluble in boiling water. In addition to parts of various shapes and sizes, they can be produced in the form of films or filaments. Depending on the composition, they may possess unusual magnetic, conducting or light reflecting properties, and can accordingly be used as mirrors, permanent magnets, light filters, for electrical printed or painted circuits, etc.

Skimmer

Finishing Supplement

Surface Treatment of Aluminium

By F. FLUSIN

Discussing some problems of producing anodic films on aluminium, this article has been translated from a Paper given to l'Association Belge d'Electrodeposition du Centre Belge d'Etude de la Corrosion. Its author is associated with the Centre Technique de l'Aluminium in Paris.

ELECTROLYTIC surface treatment methods used for aluminium and its alloys include electrolytic pickling—a process rarely used in the case of aluminium—electrolytic brightening, and, above all, anodic oxidation. It is with anodic oxidation and with the various practical aspects of the process that this article is concerned.

Fundamentally, anodizing involves the electrolysis of water.

In an electrolytic cell, containing a 20 per cent solution of sulphuric acid as the electrolyte, are placed a lead cathode and an aluminium anode. Hydrogen is liberated at the cathode; oxygen arrives at the anode, but instead of escaping from the electrolyte it proceeds to oxidize the aluminium.

On studying the variation of current strength with time in the electrolysis of water, it is found that the current attains a very high steady value (Fig. 1). If the anode being used is replaced by an aluminium anode, it will be found that the current strength falls off very rapidly and attains a steady value, which is referred to as the rate of oxidation and which, in the case of the sulphuric acid bath, corresponds to a current density of 1·5 amp/dm^2. The time during which the current drops is very short, being of the order of 0·1 sec., during which time there forms the first layer of aluminium oxide which is going to act as a barrier to the passage of the current.

Consider Fig. 2, which shows an aluminium surface covered by its natural film of aluminium oxide, the thickness of which is of the order of 0·02 micron. This aluminium surface is immersed in an electrolyte of 20 per cent sulphuric acid, which is dissociated into H^+ ions and OH^- ions. As soon as the electrical potential (12 V) is applied, the H^+ ions move towards the cathode, where hydrogen is formed. The OH^- ions move towards the anode and come up against the natural aluminium oxide film, which is an electrical insulator. These ions are, however, under the influence of a potential of 12 V, which is very much higher than the breakdown voltage of the natural aluminium oxide film, which is very thin (0·02 micron). As a result, the OH^- ions will penetrate through the natural aluminium oxide film, they will come into contact with the underlying metallic aluminium, lose their negative electric charge, and give rise to nascent oxygen which will oxidize the aluminium underlying the natural aluminium oxide film.

Further OH^- ions arriving at the anode will pass through the holes pierced by the preceding OH^- ions, will break through the layer of aluminium oxide that has just been formed, will come into contact with the metallic aluminium, lose their electric charges, and give rise to nascent oxygen, which will oxidize the aluminium *under* the layer of aluminium oxide just formed.

The growth of the aluminium oxide film thus takes place from the outside towards the interior, contrary to electrodeposits, in which the layers that have just been formed are always on the surface of the deposit.

This growth of the oxide film into the interior of the metal is the first characteristic feature of the purely electro-chemical phenomenon.

The above description of the mechanism of the process is somewhat removed from strict scientific accuracy. It does, however, have the advantage of providing a simple explanation of the process, and one which is adequate for practical purposes.

At the same time as it is being formed, the aluminium oxide film is, however, immersed in a solution of sulphuric acid, which exercises a solvent action on the film. The natural oxide film dissolves first, followed by the first layer of aluminium oxide formed by anodic oxidation, and then by the second layer.

This is the second characteristic feature of the anodic oxidation process: the reduction in thickness of the film of aluminium by chemical dissolution.

The process thus resolves itself into a competition between the rate of oxidation and the rate of dissolution, and the whole art of the anodizer is to control the parameters of the electrolytic process in such a way that the rate of oxidation will be very considerably greater than the rate of dissolution. In what follows, these parameters will be examined individually to see what are their effects on the rate of oxidation and the rate of dissolution of the oxide film.

There are four of these parameters. They are: the concentration of the electrolyte, the temperature of the electrolyte, the current density, and the time of treatment.

This oxidation-dissolution phenomenon is an extremely important one. It constitutes, in fact, the basis governing all the electrolytic surface treatment processes used for aluminium. As has been shown, if the rate of oxidation is very much greater than that of dissolution, anodic oxidation occurs.

If the rate of oxidation is equal to the rate of dissolution, electrolytic brightening takes place. If the rate of oxidation is very much smaller than that of dissolution, this gives electrolytic pickling; in fact, it is probably true to say this of pickling in general, whether chemical or electrochemical.

Electrolyte Concentration

Naturally, it is desirable to have a maximum rate of oxidation and a minimum rate of dissolution.

The rate of oxidation depends on the number of ions per unit volume, i.e. on the degree of dissociation of the electrolyte or on its electrical conductivity (Fig. 3).

The maximum rate of oxidation is obtained with a concentration of sulphuric acid of 30 per cent.

On the other hand, the rate of dissolution increases with increasing concentration of sulphuric acid, and at

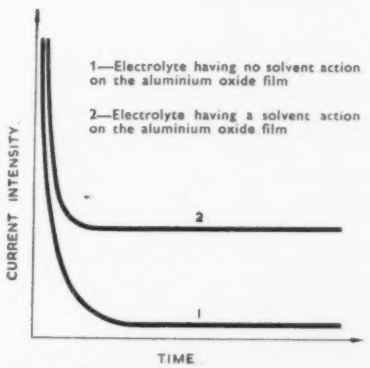
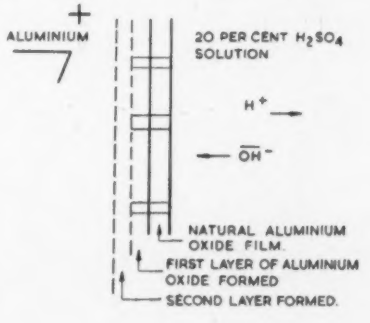

1—Electrolyte having no solvent action on the aluminium oxide film
2—Electrolyte having a solvent action on the aluminium oxide film
CURRENT INTENSITY
TIME
2
1

Fig. 1—Diagram showing variation of current intensity with time depending on the nature of the electrolysis. The steady state is attained in a few seconds

Fig. 2—Diagram representing conditions involved in the formation of an anodic field



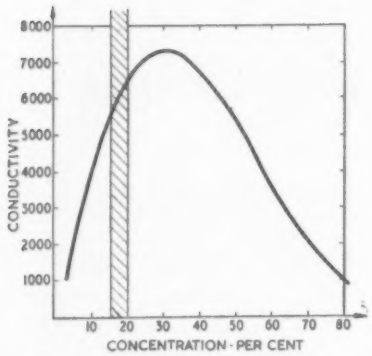


Fig. 3—Conductivity of solutions of sulphuric acid of different concentrations. The shaded band represents the range of concentrations commonly used

a concentration of 30 per cent the rate of dissolution is still too high.

That is why it is necessary to limit the concentration to the range of 15 to 20 per cent of sulphuric acid.

A solution commonly used contains 180 gm/L of sulphuric acid of 66° Bé.

Electrolyte Temperature

Theoretically, the temperature of the electrolyte is without effect on the rate of oxidation. In practice, however, it is otherwise.

On the other hand, the temperature has an enormous effect on the rate of dissolution, which is an exponential function of the temperature.

The drawback of an electrolyte which has too high a temperature is the following. Consider an aluminium oxide film in process of formation. This oxide film consists of cells and pores which constitute the passages for the ions. Dissolution of the film does not proceed in successive parallel layers but occurs at the weak spots, which are at the openings of the pores.

Assume that the oxide film has been formed at 18°C. (Fig. 4). At 22°C. the pores are much wider open and the protective value of the film will be less. At 25°C. the film will have the structure shown in Fig. 5. The openings of the pores have been attacked to such an extent that the thickness of the aluminium oxide cells has been reduced until only thin brittle peaks are left. This defect is well known by anodizers under the name of powdery coating. If a finger is passed over a sheet which has been anodized in this manner, the brittle peaks are broken away, the debris remaining on the sheet in the form of white smudges. This is the most common and most serious defect of aluminium oxide coatings, and its prevention is important.

It is found in practice that films tend to powder when formed at a temperature of 24°-25°C. At slightly lower temperatures (22°-23°C.), which do not give rise to powdery films, the properties of the film are still unsatisfactory, especially if the anodized aluminium is intended for architectural applications.

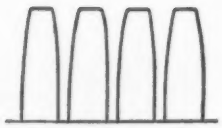


Fig. 4—Normal film. The openings of the pores are slightly tapered as a result of a normal rate of dissolution

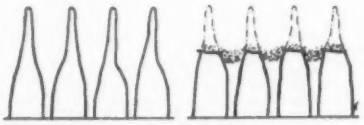


Fig. 5—Left: Attacked film. The openings of the pores are wide open as a result of extensive dissolution. The cells of aluminium oxide have developed brittle peaks. Right: Similar film. By simple rubbing with the finger, the brittle peaks of the aluminium oxide films break away in the form of a white powder

Between the films formed at elevated temperature which tend to powder, and films formed at low temperature (about 0°C.), where the films are as hard as hard chromium plate, there exist innumerable gradations, and in order to obtain films of suitable characteristics it is essential to work with the bath at 18°C. (±2°C.), that is to say, without exceeding a maximum of 20°C. This is a very important point.

Before dealing with the effect, in practice, of changes in temperature on the rate of oxidation, the effect of the current density may be considered.

Current Density

The rate of oxidation is proportional to the current density. The rate of dissolution should, theoretically, remain unaffected. In practice, however, too high a current density increases the dissolution very considerably.

If an aluminium oxide film in course of formation is considered, it is necessary to remember that the whole of the current passes through the pores. The diameter of the pores is extremely small. Investigations carried out in the laboratories of Alcoa have shown that this diameter is 0·012 micron. The electrical resistance of the pores is, therefore, very large. Since, therefore, the pores act as a resistance, this resistance will become heated by the passage of the current, and the temperature in the immediate vicinity of the film will increase, i.e. in the electrolyte in contact with the film. This may lead to the formation of a powdery film. It is, therefore, necessary that the heat generated is at once removed, which can only be done by ensuring a vigorous agitation of the electrolyte in the vicinity of the surface being anodized. A thorough stirring of the electrolyte is, therefore, required.

The considerable effect that stirring has on the anodic process can be demonstrated in a simple manner. This consists in measuring the current passing through the bath for a given work load, and in the absence of stirring. The result may, for example, be 150 amp. If stirring is then suddenly commenced, it will be observed that the current will drop to a value of, for example, 100 amp. This means that the electrical resistance of the oxide film has increased which, in turn, means that there is less dissolution of the openings of the pores by the electrolyte.

This provides an opportunity of linking two of the parameters being considered: the effects of temperature and current density on the rate of oxidation.

It is sometimes said that when the bath is cold it does not conduct the current. This is incorrect. In this connection it must first of all be noted that the resistivity of the oxide film is infinitely greater than the resistivity of the electrolyte (in the ratio of about 5,000-1).

Suppose, for example, on starting up an anodizing bath on Monday morning to anodize work which is to be dyed black, the anodizing bath is found to have a temperature of 14°C. The film produced will have very narrow pores and a very high electrical resistance R. Now on Friday evening, when the temperature of the bath was 20°C., the pores of the film being produced were relatively open and the resistance of this film was then $r<R$. With such a resistance it was necessary to apply, let us say, 13 V to obtain a current density of 1·5 amp/dm². If, however, on Monday morning the same voltage is applied to the bath which now contains the resistance R, the current density produced will no longer be 1·5 amp/dm², but only 0·8 amp/dm², for example. As the time of treatment will be the same in both cases—45 min.—the oxide film produced on Monday morning will have only half the thickness of that which was produced on Friday evening. The result will be that the film will not dye satisfactorily since, as is known, films that are to be dyed black have to be thick. The reason for the failure is not that the bath does not conduct the current, but that it is too cold and that the current density is too low. In order to obtain a current density of 1·5 amp/dm², it would be necessary to raise the voltage to, say, 18 V. Only then would the current density required to produce a satisfactory film be obtained.

This would mean that the rectifiers would have to be able to produce voltages up to 20 V.

Time of Treatment

The oxidation and the dissolution are proportional to the time of treatment. It is important not to exceed a

(*Continued on page* 309)

Precision Barrel Finishing

BECAUSE of the need for better processing and better handling in barrel finishing, considerable attention has been paid not only to the actual barrel—its size, shape, lining and speed—but also to the layout of the machine with its ancillary equipment. All needs in precision-barrelling are answered by the "Lacromatic" double cone barrel, a series introduced by The Hockley Chemical Co. Ltd., Hockley Hill, Birmingham, 18.

These barrels are available in five sizes: ½ ft³, 1 ft³, 2½ ft³, 4 ft³ and 5½ ft³, representing workloads of approximately 10 lb. up to 100 lb. of parts. They are lined with a special double rubber or plastics to prevent damage to delicate parts and to protect the barrel. Their variable speed mechanism renders them suitable for a wide variety of work, although cheaper models are arranged to run only at two fixed speeds.

The shape is virtually that of a standard type of octagonal horizontal barrel plus two octagonal cones. In operation, when loaded to the centre level there is the maximum length of slide of the surface of the chip mass, namely, a slide through a distance of one diameter. The double cones fling the work mass from each side towards the centre, which means that the work is subjected to a three-fold action. It has been shown empirically that for a given capacity and speed, the double cone barrel produces more rapid deburring than the more orthodox horizontal octagonal barrel.

The standard "Lacromatic" double cone barrels have a switch on the panel to actuate a mechanism to raise the mouth of the barrel for loading and to lower it for unloading. Alternative models are available with a handle to tilt the barrel in this way.

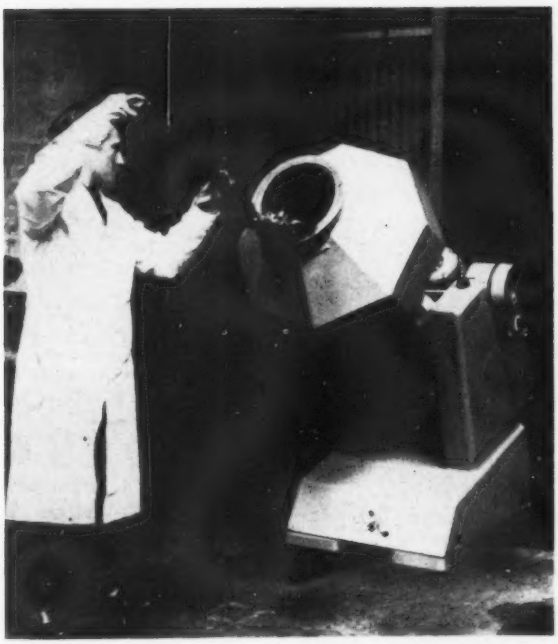
The button is pressed to raise the mouth for the loading operation. The chips are often loaded into the barrel by means of a hoist pan, but the size and height even of the largest double cone barrel enables the operator to transfer chips from the chip bin to the barrel quite easily and quickly with simply a shovel or scoop.

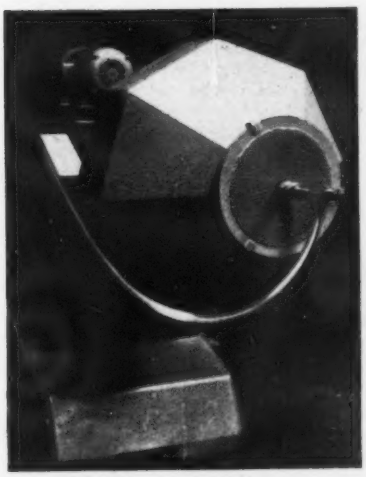
The quick acting locks enable the door to be affixed and removed quickly with the minimum of effort.

The control panel includes a time switch which can be set either to switch the machine on or off after a given number of hours. This ability to switch on is particularly helpful when, for instance, the operator wishes to load the barrel before going home at night and set it to start during the night so that it will have completed a run just before his arrival in the morning.

Because of the gear which will automatically tilt the barrel upwards or

(*Continued on page* 309)





Above : A typical installation of double cone barrels

Left : Barrel being loaded manually

Right : Hose coupling connected to water supply ready for washing out

Atomic Progress

Magnesium Canning

A MAGNESIUM alloy, Magnox A12, is used as a canning material for Calder Hall reactors and is proposed for use in the C.E.G.B. and S.S.E.B. reactors. In this article the reasons for its selection are discussed briefly and an indication given of the properties required in canning materials for this type of reactor. The properties of A12 are examined against those of possible alternative magnesium alloys.

Magnesium is superior to aluminium as a canning alloy because of its lower neutron absorption and excellent compatibility with uranium. A canning material must also be stable in contact with the coolant and, because such stability could not be demonstrated at the time, aluminium was chosen as the canning material for the Windscale reactors. During the early design stages for the Calder Hall reactors, work at Harwell[1] showed that the oxidation of magnesium in air could be improved by additions of beryllium, calcium and aluminium (Magnox alloys). Beryllium has extremely limited solubility in magnesium and cannot be introduced in significant quantities by direct additions. Aluminium and beryllium form a eutectic alloy system, and one of the purposes of the aluminium addition is to facilitate the beryllium addition via an aluminium-beryllium hardener. The improved oxidation behaviour of the alloys developed by Harwell and the British magnesium industry,[1] coupled with the improved compatibility and increase in ignition temperature in CO_2 when compared with air, led to the selection of certain of the Magnox series of alloys for further study as canning materials.

Magnox Alloys

The magnesium alloys of interest can be readily extruded from cast billets and machined. The alloy must be weldable as, in the fuel element assembly operation, end caps are argon-arc welded into the cans. Additions of about 0·15 per cent calcium in magnesium alloys are stated[2] to lower the solidus 15°-55°C. below the normal value for the alloys. The early development work showed that, although beneficial to the oxidation behaviour, the calcium addition in some Magnox alloys would have to be eliminated to obtain satisfactory weldability. Metallographic examinations revealed weld cracking to be due in part to the formation of brittle intermetallic phases. The alloy finally chosen, Magnox A12, contains only aluminium and beryllium additions, and is a weldable alloy.

Extensive development work has been carried out by the magnesium alloy manufacturers to eliminate flux, oxide and clusters of beryllium-rich inclusions in Magnox A12. This, coupled with the application of ultrasonic inspection techniques, has assured the supply of extruded A12 of an extremely high standard of cleanliness. The elimination of inclusions containing traces of flux was particularly important, since they are reactive with moisture and, if exposed during fuel element manufacture or service, might lead to perforation of the can.

Calder Hall type cans have been machined from solid extruded bar. Techniques are now available for fin rolling Calder Hall type cans or impact extruding the multi-start helically-finned cans required for the C.E.G.B. reactors. The new methods have economic advantages and may well yield cans which, after fuel element manufacture, have improved metallurgical properties associated with a finer and more uniform grain size.

Exposure of Magnox A12 at temperatures above 400°C. leads to quite rapid grain growth. Thus, after a short period in the reactor, cans on the hottest fuel elements may have developed large grains extending across the can wall. Additionally, but not normally, critical strain effects can be introduced which cause grain coarsening either during manufacture or service. The can is required to act as an extensible envelope, enclosing the uranium fuel and accommodating any distortions which may arise in the fuel. In this connection it is the ductility under multi-axial strain conditions which is important, rather than conventional tensile ductility. For short irradiations the properties of relatively coarse-grained cans appear to be adequate, and at high temperatures the alloy has considerable ductility to accommodate any strains, even when it is coarse grained. Higher mean irradiation of fuel elements might be achieved by moving fuel elements from highly-rated positions in reactors to positions where the rating is lower—a process known as "shuffling." The grain growth expected in A12 cans exposed at high temperatures might restrict shuffling of fuel elements from hot to cool positions because of the reduction of mechanical properties at the lower temperature associated with the larger grain size. Ideally, therefore, the canning alloy should have a fine grain size which is stable during heating up to temperatures of the order of 500°C.

During creep, Magnox A12, like many other alloys, develops intergranular cavities, and in advanced stages of deformation these cavities link up. Chains of small discrete cavities are also found in irradiated Magnox having a coarse grain structure, and Heal[3] has published photographs of severe examples obtained in a Magnox alloy can irradiated in a Windscale reactor. All the available evidence indicates that in-pile stress is necessary to cause cavitation, as it is in out-of-pile work. There is as yet no evidence to indicate that this cavitation phenomenon is aggravated by irradiation, even though fast neutron collisions displacing magnesium atoms from their lattice will create additional vacancies which might diffuse to, and enlarge, existing cavities or facilitate the nucleation of further cavities. No fuel element failures have been detected due to these chains of small cavities, but their presence is a potential source of weakness which it is desirable to avoid. Grain size appears to affect their distribution, and in fine grain material the cavities do not show the same tendency to form long chains.

From the above it is seen that A12 has the following advantages: (1) low neutron absorption; (2) excellent compatibility with uranium; (3) good corrosion resistance in CO_2; (4) good ductility at high temperatures. Its main disadvantages are its rather pronounced tendency to grain growth, with consequent reductions in properties at about 200°C., and its cavitation characteristics.

Alternative Alloys

An examination of alternative magnesium alloys leads to alloys based on the magnesium-zirconium system. These alloys are well known for their fine grain structures, which are stable during heating up to temperatures above 500°C. Creep tests have also shown the alloys to be less liable to cavitation. Such alloys are somewhat more difficult to produce to the necessary high standards of cleanliness from flux inclusions than Magnox A12. Also, unfortunately, their creep resistance falls off rapidly above about 350°C., and it is not yet clear whether they will have adequate strength to resist forces imposed by the coolant gas. Furthermore, French work[4] has shown that, during casting, zirconium hydride needles may form in the alloy. Should such a reaction occur between this type of alloy and moisture in the reactor coolant gas, it is conceivable that the ductility might be reduced.

Under normal oxidation conditions in CO_2 there seems little difference in behaviour between magnesium-zirconium alloys and A12. But under fault conditions, admitting air or moisture into the CO_2 coolant, A12 is significantly better.

The use of strong magnesium alloys, e.g. magnesium-manganese alloys, as cans is not favoured because of the higher neutron absorption due to the

(*Continued on page* 309)

INFORMAL DISCUSSION ORGANIZED BY THE INSTITUTE OF METALS

Protection and Packaging of Non-Ferrous Metals

(*Continued from* METAL INDUSTRY, 10 *April*, 1959)

CONSIDERABLE interest was shown in the question of expendable packings at the recent Institute of Metals discussion on "The Economic Protection and Packaging of Non-Ferrous Metals in Storage and Transit," and the extracts published here deal mainly with this topic.

DISCUSSION

L. J. Soper (Northern Aluminium Co. Ltd.):

On the question of non-returnable packs, experiments have been carried out with containers made from double reinforced corrugated cardboard. These experiments were purposely carried out with materials most likely to become damaged, such as fully annealed tube, fragile sections and flat sheet, the maximum size sheet being 3 ft×7 ft., and excellent results were obtained with all these packs. Everyone was fully alive to the fact that these were experimental packs and that they were more fragile than wooden cases and, therefore, they received every care and attention at all stages. Has anyone else used this method, or any other methods, and on what scale, and what results have they had?

If a suitable non-returnable pack could be found, it would eliminate the expense of transporting empty cases back to the works, the clerical work involved in recording the movement of these cases, and the inconvenience to customers.

Incidentally, these cardboard packs are very much cheaper than a wooden case if both types of pack are regarded as expendable first time out, but if the wooden case is used for five journeys then both forms of packing cost more or less the same.

S. G. Rydings (British Transport Commission):

There has been quite a number of corrugated fibreboard packs used, of good quality double wall material—not necessarily for non-ferrous metals—and they have been used with a considerable degree of success. The quality of the fibreboard is readily ascertainable, and it is easily maintained. Provided it is a good quality board the packs can be very good, particularly with the use of flat metal strapping; although flat metal strapping is not always good for the fibreboard case unless the inner articles are capable of a degree of compression. But we have carried quite a lot of consignments of carton goods. The handling factor does not enter into it. They weigh as much as 150 lb. in a small pack. Therefore, they have to be truck handled and they cannot be lifted up and dropped 3 ft. or 4 ft. They have carried with remarkable success.

H. Taylor (Northern Aluminium Co. Ltd.):

I wonder if the previous speaker could define what he means by "good quality"?

S. G. Rydings: "Good quality" is a fibreboard case which is made up to the standards laid down in the Railway Clearing House Regulations for good cases.

F. M. Peebles:

In answer to Mr. Soper, I cannot claim to have tried this system extensively. I have tried it in theory, and I had to give up very disappointedly. My idea was to do what many of you are trying to do, to cut out all the correspondence and debits and credits, where you consign eleven cases and the railway only manage to deliver nine.

I went into this with a give-away pack of compressed cardboard to take sheet. It costs you, say, 10s. to return every case 100 miles by rail. It costs a lot more in hidden reserves of clerical staff, debit notes, credit notes, and so on. We tell the customer: "If we are able to make this container for 15s., we are prepared to pay 7s. 6d. if you will accept a 7s. 6d. repacking charge. (I am taking these figures at random.) I found that where our source of customer was great—shall we say, one of the big aircraft firms—the returns were correspondingly so great that they had a favourable rate with the railway. Where the customer's quantity was small, it was hardly worth while our entering into an arrangement with him. I took a number of examples throughout the country of the big aircraft firms and asked them what they paid by rail per ton, and I was disappointed to find that in practically every case I could not ask them to pay a charge for give-away containers which would be an attractive project, and I had to drop the idea.

S. G. Rydings: In connection with a fibreboard case, when packing with loose wood wool we recommend most strongly the use of a "former"—that is, a case without a top or bottom—in which to place the fibreboard case, enabling wood wool to be packed all the way round without distorting the fibreboard case.

Mr. Thomas:

Mr. Peebles said that if you look at the cost of wooden cases, the transportation and the maintenance of wooden cases, when returned you might find that fibreboard was quite economic for one-trip jobs.

H. Baskerville (Imperial Chemical Industries Ltd.):

It is quite clear that Mr. Rydings spends part of his time in drawing up specifications of what the Railway Clearing House consider a good quality pack. Traders generally are fairly clear in their own minds that you can pack very differently if there is an absolutely through transit, point to point, than if the goods are to be trans-shipped, be it the railway or otherwise. I should like to know if he is also drawing up specifications for the very careful handling of merchandise so that industry generally would not have to pack in a high grade pack—a higher grade pack than it would if materials were carefully handled in these transit points.

S. G. Rydings: Handling is obviously an important factor in railway working. It is a factor which is always under consideration. It is strongly pressed on every occasion, both from the point of view of manual and the installation of, wherever possible, mechanical handling. The installation of mechanical handling depends on the use; if you cannot fully use a £1,000 or £2,000 machine, it is no use buying it. Therefore, mechanization is going ahead wherever it is economically possible.

The exhortation of staff with regard to handling is a normal procedure. The standard I tried to illustrate is a basic standard, which stems from the railway's position as a common carrier, bound to accept everybody's goods under set conditions of transport. Therefore, the packing standards are basic. If anyone comes along with full loads, the basic standard is trimmed. Obviously, you cannot have a general standard for something below the basic as applicable generally. It must be related to the quantity of traffic and the value of it.

You cannot give a general answer; you can only say that basically there are standards which are trimmed according to the quantity and quality of the traffic.

W. D. Rance (High Duty Alloys Ltd.):

We have now had about two years' experience of the non-returnable fibreboard pack. We find it is economical and the customers like it. We use it for aircraft customers and for ordinary commercial customers and, by and large, we are very pleased with it. We use a light wooden stillage and nail to that a fibreboard base. We then pack our sheets and put them into a complete envelope of kraft union. There is a top of fibreboard, and it is bound longitudinally and transversely.

As far as costs are concerned, we find it costs us about 0·3d/lb. That is the packing material cost, and not the transport cost. In addition, it does cut down a lot of recording and correspondence.

Mr. Soper mentioned packaging of coils and said his company use a square stillage and a top. We use the same sort of thing for packing circles. We have a square stillage with runners to it that you can sling with rope or use a fork lift truck. Then we stack the circles so that the height is not greater than the diameter, put a wooden top on and band around. We have used a lot of these. This type of stillage is returnable. We only send it to customers with whom we have continuous business. We find it very satisfactory. The customers like it because all they have to do is to cut the bands and they then have a complete pile of circles for use.

S. G. Rydings: Could I ask Mr. Soper what quality of interleaving paper they are using in between the sheets?

L. J. Soper: Mr. Taylor has been carrying out experiments with this paper, which is, of course, a neutral tissue.

H. Taylor (Northern Aluminium Co. Ltd.):

It seems that packaging committees are very popular. We also have a packing committee; tissue paper for interleaving

has been one of the subjects which has been studied.

What are the attributes of tissue paper for interleaving purposes? The main purpose in the case of aluminium is simply to separate two surfaces to prevent the high spots on the sheet fretting. The paper has, of course, to be sufficiently strong to allow of it being placed by mechanical means between the sheets, but there is no other purpose. Fretting appears as small, black spots, sometimes with cavities, sometimes with raised surfaces. It is caused by small movement under pressure.

When tissue paper is used for interleaving, the paper itself presents a hazard of corrosion due to the salts which are present. Tissue paper, of course, is extremely absorbent. In our experience, normal tissue contains something of the order of 8-10 per cent water. Paper with this level of water is seldom corrosive. More moisture is necessary before corrosion can occur, and then only if certain compounds are present in the paper. There is, of course, the wellknown work of Dr. Angel and others, which defines the chloride content and *p*H, which, in their opinion, will cause corrosion. We find that we cannot lay down rigid rules to cover all tissue papers. One must first of all carry out corrosion tests with the paper of an individual supplier, and then lay down the chemical limits which will fit in with that particular brand of paper. The general overall specification which we have standardized now for some 20 years is that a paper must not contain more than 0·05 per cent of chlorides, calculated as sodium chloride, nor more than an acidity of 0·1 per cent, calculated as sulphuric acid; but these are simply outside limits. It is possible to get papers well inside these limits and to have corrosion, provided, of course, the paper becomes damp. One simple test for the corrosive nature of tissue paper is to take about two dozen clean circles and to interleave them with tissue paper. As each piece of tissue is placed on a circle, 2 c.c. of distilled water per ft^2 is dripped on to the paper. These circles are then allowed to stand in a clean atmosphere for a month.

There are, of course, corrosion inhibitors which can be incorporated in the paper, and which generally increase the price of tissue paper by two or three times. Some of these inhibitors are very good, others need treating with care because they themselves will cause corrosion in contact with aluminium. Generally, from our point of view, all inhibitors have one common aim—that of preventing corrosion which can possibly ensue from the use of low quality tissue paper.

With reference to wrapping papers, experiments have been undertaken with most of the wrappings which are commercially available.

Very generally, the problem of sealing offers an extreme bias on the choice of wrapping medium. The conclusion has been reached that ordinary gummed paper or self-adhesive sealing strip will satisfactorily seal. Wrapping, generally, has to be sufficiently strong not to tear over sharp corners. It must protect from extraneous moisture, and it must also protect from condensation—the greater hazard of the two. At present we have found no wrapping superior to what is technically termed kraft union, which is simply two layers of brown paper with a layer of bitumen between.

It is our belief that if protection is offered by inner wrapping, then the moisture content of a packing case is only troublesome in so far that it will affect the dimensions of the case and consequently allow movement of the contents on drying-out.

Dr. F. A. Champion (British Aluminium Co. Ltd.):

On the subject of tissue paper, we have worked to the specification for impurities in the paper which is commonly adopted in a number of Chemical Inspectorate specifications of the Ministry of Supply, on chloride, sulphate, and *p*H (rather than acidity), which, I think is a tighter control than that mentioned by Mr. Taylor. Our experience indicates that if you are within that specification and the paper becomes wet in transit or some other way, you will get staining, and the paper will increase the liability to that staining, but you will not get actual corrosion, pitting, or anything of that kind. If you exceed that specification, then when the paper becomes wet you are liable to get actual pitting.

On this question of wetting, there are the extreme cases where you do get liquid water entering, through the case becoming exposed to rain, due to slipping of the tarpaulin and so on. It is sometimes argued that the case has arrived quite dry and the water must have been there when it was packed. It should be remembered that the water will come through the case and any weakness in the lining, and then be drawn into the stack of sheets or into the coil by capillary attraction and progress inwards. When drier conditions prevail, the drying proceeds in the same direction. So you can be left with water in the stack while the case and even the edges of the sheet may be dry, and you may finish up with a band of staining on the sheet some distance from the edge. So the condition of the pack is not always a guide to whether liquid water has come in or not.

The more prevalent hazard is the entry of water vapour, which is very much a matter of the length of the journey and the variation in the climatic conditions through which the pack passes, particularly the number of cycles. In a variation of temperature you are liable to get breathing of the pack, so that although you may wrap in kraft union, if the joins are not effectively sealed you can get breathing through those joins. According to the number of cycles so the amount of water breathed in will increase, and the variations in temperature will determine whether that water condenses. It will condense on sharp edges more readily—that is, on the edges of sheets—and then be drawn in.

Let me say here that I am speaking somewhat from the theoretical angle, and it may well be that some of my colleagues with more practical knowledge and cost factors in mind will disagree with me on some points. The whole question of packing is a compromise between protection, practicability and cost. If you are going to spend your money on kraft union paper, or some such standard, you want effective sealing of the joins. I am afraid I would disagree with an earlier speaker that those joins can be made by ordinary brown paper strip; you do need a better quality of strip if you are going to get an effective seal.

On the other hand, I do realize that to seal effectively all the joins in kraft union lining in a case is extremely difficult, if not impossible. It struck me in listening to the discussion on fibreboard packs that they did help in that respect, that you could get at the outside of the lining much more effectively, and you might be able to seal the waterproof envelope effectively.

Polythene has been put forward as an effective seal. As it is put on at the factory it can be effective, but it was suggested that an odd tear does not matter. I say it does, since the moisture will be breathed in through such gaps. Can you prevent tearing of such an envelope on sharp edges of sheets, circles, and so on, in the sort of handling that one gets in transit?

We have found vapour phase inhibitors to be unreliable on aluminium. Sometimes they will work, more often they do not, even though there is free movement of the air, and, as has been pointed out, one cannot normally get free movement of air, there is so little of it in a pack. They are effective on aluminium when in solution, and could be effective when in impregnated tissue paper, but that again puts up the cost. The use of some drying agent, such as silica gel or activated alumina, is open to question in that you are liable to get some attrition in transit. If you are going to allow access of air between pack and dehydrant you are likely to allow dust to come through into the pack and you are faced with a serious abrasive.

We have tried mouldable wax wrapping. One considers using this sort of expensive pack on long journeys with cycling conditions. One then comes up against the serious disadvantage of mould growth, which, if it does not affect the wrapping itself, will affect the seals.

As already mentioned, the main reason for using tissue paper is to separate the sheets so that one does not get fretting. I do not think it is always realized that fretting results from a microscopic relative movement of the two surfaces which are in contact under pressure. I do not believe it is practicable to prevent that movement by any sort of mechanical means in the pack. You cannot prevent sheets moving to that extent. The slightest flexure of the stack of sheets is going to give that movement, with the welding up and separation of those high spots on the surfaces which initiate fretting corrosion. It is not a true abrasion caused by grit or anything of that kind. That gives a more longitudinal effect, whereas transit abrasion pits are only slightly elongated. There is another point in that connection: oiling does not provide any protection, but rather aids the slight movement.

Mr. W. McLeod Ross (Fairey Aviation Co. Ltd.):

First, I would point out that I am speaking as a chemist and not as an economist. In other words, quite frankly we are concerned with getting the best product, and the price must not be the deciding factor.

Reference has been made to the avoidance of mechanical damage with respect to sheeting, tube and extrusions which are used in the form in which they are supplied. I cannot accept that the operator who is either packing these or unpacking them is solely responsible for any damage. Considering sheet material, it is necessary to provide in the packaging adequate protection against corrosion and mechanical damage both during transit and unpacking. I do not consider sheets of interleaving tissue to be sufficient, however careful the control of sulphate,

chloride, pH, etc. A stronger material is required which will protect against scratching and fretting of the material, thus lessening the danger of unwanted stress concentrations as well as saving many man hours by deleting much of the labour of burnishing over such defects where a good finish is necessary. In recent months, promising materials based on acrylic polymers have been brought to our notice. We have made a preliminary examination of one of these acrylic polymers dispersed in trichloroethylene and, as it shows considerable promise as a preventive against scratching and corrosion, I should like to hear the views of one of the supplier companies on the economic side as to whether they consider they can supply sheet or extruded finished materials already coated with this polymer, or not. As far as the users are concerned, removal of this type of material is simply effected by degreasing.

I have noted that one or two comments were made on sealed packages. We tend to steer clear of sealed packages, principally because we supply fabricated materials as opposed to raw materials, and as an example, aluminium fabrications may contain cadmium-plated fasteners, or they may be bolted to other structures. There are normally organic materials present, either in the form of adhesives, lacquers or paints, and the incorporation of these in a totally enclosed atmosphere can be very dangerous. In fact, we had a salutary reminder of that quite recently. So I would stress that it is essential to examine the effects of sealing the package, if, in fact, you can seal it.

I have noticed that other people have mentioned the effects of moisture in woods. I would point out that several woods can give rise to acidity in the moisture, which can have an extremely adverse effect on metals such as cadmium, zinc and, possibly, copper.

With regard to vapour phase inhibitors, one of my constant tasks is guiding, shall we say, untutored personnel from too great a use of vapour phase inhibitors. I agree with Dr. Champion that use of these with regard to aluminium alloys is questionable; in certain circumstances, cases have been known of accelerated corrosion arising from their use.

There has been mention made of wood wool or shavings in packaging. We dislike the use of this material (a) because its origin is often very doubtful, and (b) because it is rather prone to contain substances which cannot be controlled. For expensive items, and most aircraft items are expensive, we would prefer to use packages based on hair or fibre, bonded with rubber or plastics materials.

As far as our own packaging is concerned, we are largely tied to specification D.E.F.1234, which lays down the limitations and rules for packaging for the Services.

(To be continued)

Atomic Progress—*continued from page* 306

manganese, while cerium-containing alloys have poor oxidation resistance. Small quantities of magnesium-manganese alloys can be tolerated as structural materials, and a Paper[5] presented at Geneva by AEI-JT gives some data on the mechanical properties and creep behaviour of these alloys.

Makin and Minter[6] have irradiated a series of magnesium alloys at 40°-50°C. to avoid annealing effects. Subsequent mechanical tests revealed no difference in yield stress, U.T.S. or elongation to fracture between irradiated and un-irradiated samples. The integrated dose of about 10^{20} neutrons/cm^2 produces a marked hardening in other metals, and Makin and Minter conclude that the irradiation hardening of magnesium is annealed at these temperatures. In-pile tests are necessary to show whether there is a change in properties in the presence of a neutron flux.

The number of alternative alloys to A12 is limited if one considers conventional melting techniques. The Paper[7] presented by the Russians at Geneva mentions a novel technique for producing magnesium alloys containing several per cent of beryllium by distillation of the two metals in vacuum and simultaneous precipitation on a common condensation surface. Small "wire" fuel elements were made with coatings of this type. Whilst this technique would be extremely difficult to apply to the much larger Calder type fuel elements, it stimulates curiosity as to what might be developed using other techniques for alloying, e.g. powder techniques.

Many thousand A12 canned fuel elements have been irradiated successfully, and the number of failures has been very small. Much credit is due to industry for their efforts to improve the quality of A12. It seems likely that the new production processes currently being considered will give fuel elements with even better properties. However, interest in alternative alloys will continue as an insurance against any unforeseen difficulties which might be encountered.

References

1 British Patent No. 776,649.
2 E. G. West; "The Welding of Non-Ferrous Metals," Chapman and Hall.
3 T. J. Heal; *Nuclear Eng.*, Feb., 1958.
4 J. Herenguel, J. Boghen and P. Lelong; C.R. Acad. Sci-Paris, 1957, No. 245, 2272.
5 G. C. E. Olds, *et al*; 2nd Geneva Conference, Paper A/Conf. 15/P/1455.
6 M. Makin and F. J. Minter; A.E.R.E., M/M 1957, p. 114.
7 K. D. Sinelnikov, et al; 2nd Geneva Conference, Paper A/Conf. 15/P/2153.

Precision Barrel Finishing—*continued from page* 305

downwards, these double cone barrels do not require complicated loading and unloading equipment, as is frequently the case with barrelling machines.

At the end of a process, the washing of the chips and parts in the barrel is carried out by the fitting of the wash-out door. Clean water is injected through the special universal hose coupling in the centre of the door.

The water hose to which this coupling is attached is usually suspended from above, adjacent to the barrel. When water is required, all that is necessary is for the coupling to be slipped over the socket in the barrel door, which automatically allows the flow to commence. When the coupling is slipped off, the flow ceases. While flushing, the barrel is turning to ensure that the work mass is well washed. This system is a complete departure from the practice with most horizontal barrels which do not enable water to pour in while they are turning. The saving of time here can be considerable, particularly in the case of a barrelling compound which has produced a very thick foam.

When the work mass is clean, the barrel is emptied by gradual tilting. The fact that this type of barrel can be kept constantly turning during unloading gives the operator very accurate control of the steady flow of chips and parts from the mouth of the barrel. This control is particularly helpful in the case of delicate parts.

For unloading ferrous components it is often convenient to use a strong hand magnet dipped into the mass of chips and parts while the barrel is turning. By this means the parts can be completely unloaded from the barrel without the removal of the chips.

Surface Treatment of Aluminium—*continued from page* 304

time for which the length of the pores, i.e. the thickness of the film, will attain a limiting resistance for which the rate of oxidation will be equal to the rate of dissolution.

For practical purposes the following can be assumed as satisfactory:

For decorative anodizing—10 to 30 min.

For protective anodizing — 30 to 60-80 min.

Under the above conditions of concentration, temperature and current density, the rate of growth of the oxide film is of the order of 0·3-0·4 micron/min/amp/dm^2. Therefore, with a current density of 1·5 amp/dm^2, the rate of growth will be about 0·5 micron/min.

(To be continued)

ENGINEERING, MARINE, WELDING AND NUCLEAR ENERGY EXHIBITION

British Engineering Products

OPENED at Olympia, yesterday (Thursday), this engineering exhibition once again provides for engineers in all fields an opportunity to inspect the products of British engineering in the four sections of general engineering, marine, welding, and nuclear energy. Over 500 manufacturing firms are taking part in this combined exhibition which will remain open each day (except Sunday) until April 30. There are many exhibits which will prove of much interest to metallurgists and all those concerned with the working of non-ferrous metals and below we give a brief summary of some of these exhibits.

Accles and Pollock Ltd.

Many examples of seamless tubing in stainless and other steels are shown. Also examples of tubing in zirconium, tantalum, titanium, molybdenum, vanadium and niobium.

Acheson Colloids Ltd.

The main feature of this exhibit is a display of industrial products during the manufacture or treatment of which "dag" dispersions of colloidal graphite and colloidal molybdenum disulphide play an important part. The exhibits include finished and semi-finished parts, equipment pre-treated to provide built-in dry lubrication, packings and bearings in which "dag" colloidal graphite is impregnated or incorporated, electrical and electronic accessories and many other examples from various industries.

Albright and Wilson (Mfg.) Ltd.

On this stand examples of nuclear, marine and general engineering equipment treated by the following methods are shown:—"Kanigen" chemical nickel plate; "Plusbrite" electroplated bright nickel; Nickel sulphamate plating; Potassium Stannate plating; Copper Pyrophosphate plating, and "Phosbrite" chemical polishing (for aluminium, copper and their alloys).

Anti-Attrition Metal Co. Ltd.

Here are to be seen "Anti-Attrition" bronzes and whitemetals, as used by all branches of mechanical and electrical engineering. A wide range of bearings, lined and unlined, including armature and suspension bearings for electric and diesel locomotives. Railway, carriage and wagon bearings, non-ferrous sand, die, shell-moulded, and centrifugal castings. Castings for oil refineries and chemical plants. Chill and spun cast sticks, 8″ semi-machined bushings, aluminium, sand, and die-castings.

A.P.V.-Paramount Ltd.

This company shows castings in the Paralloy range of stainless, special alloy and carbon steels for the chemical, nuclear energy, marine and processing industries. The Paralloy range of "Forging-Quality" cast stainless steel welding pipe fittings for the petroleum, chemical and other industries.

N. C. Ashton Ltd.

From this Yorkshire firm comes a display of aluminium bronze and cupro nickel alloys; aluminium bronze forgings; welding wire and rods in aluminium bronze alloys, and "Narite" deep drawing dies for forming niobium, molybdenum, tantalum, etc. Non-spark, non-magnetic and corrosion-resistant tools.

Baldwin Instrument Company Ltd.

A large variety of valves and power cylinders are on show together with a number of interesting new products. Many of the exhibits are quarter sectioned in order that visitors may observe the method of construction and quality of finish. One interesting exhibit illustrates the use of standard equipment in increasing the productivity of an old machine tool.

Birlec Ltd.

Exemplifying a new series in the range of Birlec mesh-belt conveyor continuous furnaces for annealing and brazing, the centre-piece of this exhibit—a Hump-back furnace—shows several interesting features. The application of Birlec dryers to factory compressed air systems is also illustrated. The display emphasizes the simplicity of a fully automatic Birlec compressed air drying installation as included in a large factory compressor house. A model of the Birlec Sealed Quench furnace is also shown and is arranged to illustrate an automatic operating cycle under timed sequence control. This type of furnace is designed for gas carburizing, carbonitriding, clean hardening and carbon restoration processes. Since it can be equipped with completely automatic control of atmosphere composition, the correct carbon potential can be maintained and recorded without the need for any manual adjustment.

Birmingham Battery and Metal Company Ltd.

Once again this company is exhibiting a comprehensive range of tubes, hot rolled sheets and plates in copper and copper alloys. They give particular emphasis to special corrosion resistant alloys demanded by modern conception in heat exchanger and condenser equipment and other engineering needs. One of the heaviest condenser plates in yellow metal produced in this country weighing 2¼ tons and 10 ft. 6 in. diameter, by 1¼ in. thick will be found on one of the company's two stands. In addition a range of hot brass stampings such as impellers, flanges, etc., will be displayed by the subsidiary company, Guests Brass Stamping Company. In general the company includes examples of copper tubes in a variety of sizes, "U" bends in copper, "Batnickon" and brass, also copper and brass rods and bars.

B.K.L. Alloys Ltd.

Tubular welding fittings, elbows, return bends, tees, reducers, caps and welding neck flanges for the chemical and petroleum industry are featured on this stand. There is also a special display of return bends for use in heat exchangers for atomic energy stations.

The Bridge Foundry Co. Ltd.

This display includes a wide variety of sand- and die-castings being produced for industry. These castings are of a very high quality and precision.

British Aluminium Company Ltd.

Especially featured on this stand are models, photographs and actual exhibits of manufactures of aluminium and aluminium alloys in unwrought and wrought forms.

British Thomson-Houston Co. Ltd.

Industrial electrical and mechanical equipment is shown on this company's stand, also models of hydro-electric and rolling mill equipment, while gear production is represented by a large marine gear wheel and geared motor units.

British Oxygen Gases Ltd.

Presented here are the latest developments in oxy-acetylene and inert gas welding and cutting equipment and processes. Practical demonstrations are being carried out with the latest range of welding and cutting equipment including the Saffire. Demonstrations are also being given with the Bison Mark II profile cutting machine and the Bantam—a lightweight portable cutter. The Argon processes are also featured.

Bronx Engineering Co. Ltd.

This Worcestershire company is exhibiting plate bending rolls, a 60 ton press brake of new design and named "Matador", a multi-cross-roll tube straightening machine, and an 8 ton hand operated press brake.

The Brockhouse Organization

Six companies within this organization are represented. Brockhouse Engineering Ltd., specialists in automatic hydraulic transmission systems; Brockhouse Drop Forge Division, carbon and alloy steel drop forgings; R. J. Hunt and Son Ltd., grey iron castings; Thomas Chatwin and Company, precision engineering; Warwick Rim and Sectioning Co. Ltd., sections in ferrous and non-ferrous metals, and Kaye Alloy Castings Ltd., which specializes in the production of gravity and pressure die-castings.

The David Brown Companies

Representing this extensive concern are the Coventry Gear Division, the Foundries Division (showing "Taurus" bronze castings, alloy and carbon steel castings, precision castings and shell moulded castings); the Industrial Gear Division; the Jackson

Division; the Keighley Gear Division; and the London Gear Division.

Consolidated Pneumatic Tool Co. Ltd.

The largest item which this firm is showing is one of their class FE range of compressors shown for the first time. The design of this range of horizontal, double acting balanced opposed compressors, lends itself to construction in a large number of sizes suitable for a wide range of applications. New additions to the lightweight range of pneumatic tools are also shown as well as over one hundred different types of industrial power tools.

Copper Development Association

On this attractive copper clad stand is displayed a selection of the many applications of copper and its alloys in a number of different fields of engineering. An interesting working example of a hydraulic rotor jet cleaner for automatic cleaning of tanks, vessels, etc., typifies how the copper alloys can provide designers and manufacturers with strong, accurate and pressure tight castings possessing excellent machining qualities, simple methods of forming and a high degree of resistance to corrosion.

Deloro Stellite Ltd.

Here are being given demonstrations of "Stellite" facing by spray-fusing and illustrations of many different methods of applying "Stellite" including the new sprinkle-fuse process for protecting components against onerous conditions of wear, heat and corrosion. Castings produced by shell moulded, sand and precision methods for the conditions mentioned above, and a representative range of all other products of the firm including tipped tools, toolbits, milling blades, drills for hardened steel, workrests and the Heavy Duty parting tool.

Delta Metal Co. Ltd.

This group of companies is making a display of products including tubes for condensers, sea-water lines and tanker cargo heating coils in "Deltalbra" aluminium brass and other non-ferrous alloys. Extruded sections, tubes and rolled metal for ships' superstructures in "MG5", "Duralumin" and other aluminium alloys. "Delta" bronzes for mouldings, handrails, grilles, etc. "Sanbra" plumber's brassfoundry and "Conex" brass and copper fittings. "Deltathene" high density and "Deltaplast" low density polythene tubes for marine piping applications.

Dohm Ltd.

Specially featured by this group are the following products:—Shell moulding pre-coated resin sand; foundry plumbago, incorporating pure graphite; high refractory glaze for foundries, steel and steamraising plant; plastic refractory for speedy repair and reinforcing linings; graphitic lining; shotblast abrasives—round shot and angular grit, wire pellets; metallic shot for foundry backing; metals in powder; sand for CO_2 process; fuel oil purifier, for reducing sludge formation, increasing atomization and combustion efficiency.

Dualloys Ltd.

On this stand may be seen all types of plain bearings, including copper-lead and lead-bronze lined, steel back (thick- and thin-wall); white metal lined bearings, both steel back (thick- and thin-wall) and gun-metal backed; sintered structural parts and self-lubricating bearings from ferrous and non-ferrous powders. Also a range of "Dualloys" babbitt metals, and "Dencas" chillcast phosphor bronze, a material cast by a special Dualloys process, enabling phosphor bronze to be supplied with a minimum tensile strength of 25 tons and without porosity. Shell mould castings in all non-ferrous alloys.

English Electric Co. Ltd.

This company exhibits examples of its comprehensive range of arc welding products and ignitrons for precision control of resistance welding equipment. Of particular interest is the newly introduced LWAD500, an oil-cooled portable rectifier equipment incorporating silicon rectifiers, with an output of 500 amps D.C. or 600 amps A.C., depending on the type of work.

Eutectic Welding Alloys Company Ltd.

Demonstrations are given of the "Low Heat Input" welding process with "Eutectic Low Temperature Welding Alloys" which minimize distortion, warping and damage to the parent metal. The range includes flux-coated EutecRods for joining and overlaying steel, cast iron, copper, brass and bronze by torch application—the flux promotes capillary flow and reduces bonding temperature. A new range of solder-type alloys is now available for universal application. Special EutecTrodes for abrasion and impact resisting hard overlays, and Chamfer-Trode/Cut-Trode metal working electrodes in addition to an extensive range of special metal joining alloys, for application at reduced temperature to all types of parent metals.

Fawcett Preston & Co. Ltd. (Incorporating Finney Presses)

A range of Greer-Mercier Hydro-Pneumatic Accumulators and Alleviators for hydraulic power storage and shock alleviation are exhibited here. Also a working model press (made by Fawcett Preston apprentices) for fibre baling application.

Fox Chemical Engineering Works Ltd.

Featured by this company are Polymotion barrel finishing machines. D.S.4 with built-in separator and A.C./D.C. variable speed. D.2 with screen tray and A.C./D.C. variable speed. Perfix 2-way degreaser. Perfix Junior. Barrelling materials and equipment.

Gas Council, The

The theme of this display is "Research and Development", featuring work on the industrial uses of gas at the Gas Council's two research stations and at the Area Board development laboratories. High velocity jet burners may now be accurately designed for high speed heating and localized heating. The construction of a variety of these burners is demonstrated and examples of application to modern production methods are shown. Automatic ignition and control equipment which has been developed for this purpose is included.

General Electric Company Ltd.

This stand displays a self excited alternator with "Accurex" static regulator. This will provide a supply to motors and fluorescent lighting to demonstrate the constant voltage characteristics and absence of line disturbances when motors are started up direct to line.

Harvey, G. A. & Co. (London) Ltd.

Exhibits here include industrial plant, sheet metal and steel platework. Perforated metals of every description. Ornamental grilles and ventilating panels. Woven wire gauze and wirework, gilled tubes, steel flanges, office furniture in steel, lockers and storage equipment. Calorifiers, ventilators and chimneys, mild steel gutters, galvanizing.

C. and L. Hill Ltd.

This company, together with its associates—Hill, Alzen (Sales) Ltd., and C. and L. Hill (Diecastings) Ltd.—are making a display of their respective products including the Alzen 305 "White Bronze" bearing alloy; castings in non-ferrous metals, shell moulded castings, and aluminium alloy gravity diecastings. Among the castings produced are those in brass, phosphor-bronze, acid resisting bronze, high duty manganese bronze, aluminium bronze, high conductivity copper, aluminium and aluminium alloys including heat-treated alloys, and "Hilchil" chill-cast-phosphor bronze bars.

Hilmor Ltd.

This company is exhibiting a comprehensive range of hand operated, hydraulic and motorized tube bending machinery. Special prominence is given to the mandrel type machines designed to produce completely full bore bends on extra short radii, cold and unfilled, which are widely used for pipeline construction in nuclear power projects, in chemical plant and steam installations, shipbuilding and repair work, aircraft components, transformer bends, motor vehicle exhaust pipes, tubular furniture and cycle handlebars, etc. Several new machines are being shown for the first time and experienced operators are in attendance to give expert advice on all tube bending matters.

Holden & Hunt Ltd.

Five "Universal" pedal operated spot welding machines and a complementary range of air operated machines are exhibited, each having a different arm arrangement. A 25 kVA press type spot welder typifies H and H's range of sliding head machines as does a 200 kVA projection welder. Four auto wire butt welders rated from 3 to 30 kVA can be demonstrated with differing clamping control. No. 4 and No. 5 manual flash butt welders have welding capacities of 0·3 and 1·0 sq. in. respectively. Single, twin and triple head rivet heaters rated from 6 to 30 kW are capable of heating rivets from $\frac{1}{2}$ in. $\times \frac{1}{4}$ in. to 6 in. $\times 1\frac{1}{8}$ in.

Welding demonstrations can be given on a number of machines, and a comprehensive selection of "Scadcu" electrode tips and typical examples of resistance welding applications can be examined.

Holroyd, John, & Co. Ltd.

This company is showing several examples from their standard range of H type worm reduction units, underdriven, overdriven, vertical and double reduction types, and worm gear units to

B.S.S.3027:1958. A range of F type worm reduction units made in three sizes, 1⅛", 1⅜", and 2½" centres: also 2¾" Verso reduction unit. Examples of worm gears, spurs, helical and double helical gears, also screws and nuts. Helical compressor rotors. Worm-wheel blanks in Super Holfos (Regd.) centrifugally cast phosphor bronze and tubes for bushes and bearings, etc., made in Holfos Spuncast (Regd.) phosphor bronze, silicon bronze and leaded bronze, together with finish machined components. Shellcastings made in Holfos (Regd.) phosphor bronze and in other copper alloys including aluminium bronze and leaded gunmetal. A selection of forgings and blanks in carbon and alloy steels.

Hoyt Metal Co. of Gt. Britain Ltd.

The exhibits of this company include anti-friction metals, plain bearings, lined and solid; Tinmans' and plumbers' aluminium solders; chill cast, die-cast and cold drawn phosphor bronze, gunmetal and bronze castings; Kirksite "A" metal for press tools, dies, blanking etc., fusible alloys, including matrix and tube bending metals; Hoyt powder flux, tinning compounds, and "Minifric" dry lubricant, also electric melting pots.

Imperial Chemical Industries Ltd.

From the Metals Division of this company comes an imposing display of examples of extended surface tubing for fuel cans in aluminium, magnesium and zirconium alloys for nuclear reactors; "Integron" integral finned steel heat exchanger tubing; titanium, zirconium, niobium, vanadium and other new metals in wrought forms. Then too there are titanium and zirconium in strip, sheet, tube, wire, rod, bar, billet, slab and forging stock; examples of the "Kynal" aluminium alloy products; copper and copper alloy strip, sheet, rod, extrusions and semi-fabricated products; welding and brazing rods and wires; copper anodes, and platinum faced titanium electrodes.

Industrial Pyrometer Co. Ltd.

This Birmingham company is providing an interesting exhibit of temperature measuring and controlling equipment including temperature indicators—single, multi-point, portable and foundry. Also recording controllers, indicating controllers, and safety controllers of the mechanical and electronic types. There may also be seen pyrocouples and pyrocable, low pressure motorized, and magnetically operated control valves, hand valves, pressure switches, vapour pressure indicators, and thermometers, mercury in glass thermometers, water and mercury column gauges.

Ionic Plating Co. Ltd.

This metal finishing division of the G.K.N. group of companies is exhibiting examples of electrodeposition of any finish on any basis metals, components of any sizes from a pin head to a bumper bar in decorative finishes, protective finishes, and special finishes, i.e. silver, gold, rhodium and indium plating.

Keith Blackman Ltd.

Fan engineering equipment and industrial gas apparatus forms the keynote of this company's exhibit. Among the outstanding exhibits are two of the new, compact and attractively finished (grey and royal blue) "Aristocrat" centrifugal fans which are being shown for the first time at any exhibition. This fan type is stated by the company to offer many advantages not least of which are its low sound level in operation, a large volumetric capacity and good efficiency over a wide operating range and sturdy construction. Representative of the company's scope in the large fan field is a 70 in. type AR impeller with backward bladed aerofoil section blades providing efficiencies up to 90 per cent. This fan is used for induced draught, air conditioning and mine ventilation purposes and handles large air volumes against moderately high resistances. The stand also displays a cross-section of the "Tornado" range, while in the industrial gas equipment field is being shown a number of gas burning and controlling equipment including injectors, burner heads, governors, valves and air/gas compressors.

Langley Alloys Ltd.

Products on this stand include bronzes, nickel alloys and stainless steels for all kinds of applications in marine, nuclear, chemical and general engineering. Conventional sand castings, castings by CO_2 process and shell moulding in a wide range of specifications including the Hidurax aluminium bronzes, Hidurel high conductivity alloys and Langalloy corrosion- and heat-resisting nickel alloys. Rolled bar, forgings and stampings in the Hidurax and Hidurel series as well as in Hidurit manganese bronzes.

Machine Products Ltd.

This Wiltshire company are specialist manufacturers of high strength components by the powder metallurgy process in iron, steel, nickel alloys, bronze and brass. The finished components can be case-hardened, plated or impregnated according to the material used. Many examples of components produced by powder metallurgy are displayed.

Marston Excelsior Ltd.

A selection of the company's products in the fabrication of aluminium, titanium and other non-ferrous metals, etc., is exhibited. Products include heat exchangers, pressure and vacuum vessels, pipework, bursting discs, etc.

H. J. Maybrey & Co. Ltd.

Many examples of aluminium sand, gravity and pressure die-castings are being shown by this company. All examples of sand and die-castings are produced from patterns and dies made in the firm's own pattern and tool shops.

Metallizing Equipment Co. Ltd.

Metal spraying equipment, accessories and supplies are featured on this stand. The exhibits include completely automatic metallizing, designed for heavy-duty or continuous production applications, electronically controlled for production and transfer line installation. Also the current range of metallizing guns and equipment, from the small, low-consumption, hand-operated gun to the heavy-duty all-purpose machine.

Metallisation Ltd.

On this stand is demonstrated the latest equipment for the purposes of applying—anti-corrosive coatings; heat resistant coatings, reclamation of worn parts, and other exhibits include specimens showing the technical and practical aspects of the processes.

Mond Nickel Company Ltd.

The properties of nickel, nickel-containing materials, the platinum metals and S.G. iron, are featured on this company's stand. Divided into sections, the stand covers corrosion resistance, plating, welding, physical properties, strength at high temperatures and toughness at sub-zero temperatures. Several of the demonstrations are on view for the first time. These include the creep-resistance of the platinum metals, sub-zero properties, integral sheath thermocouples, and apparatus for testing the corrosion-resistance of materials under thermal load. Another new exhibit is a metal filter cloth produced by electroplating.

Mono Pumps Ltd.

A complete Mono Marine Pressure System for domestic service is demonstrated on the stand. Automatic operation of the fresh water, salt water and common standby pumps is effected by a multi-motor control panel specially designed for the Mono system. The "P" type Mono pump for handling dry powder is demonstrated by pumping a fluidized powder through a circuit of piping erected on the stand. The range of industrial Mono pumps exhibited covers types for handling free-flowing, viscous, corrosive or abrasive fluids and liquids containing small solids in suspension.

Non Ferrous Die Casting Co. Ltd.

Brass and bronze gravity die-castings are shown in a number of alloys varying from a free-cutting lead brass to a bronze having a tensile strength of 40 tons per sq. inch, also aluminium castings produced by both the gravity and the low pressure processes in a range of material specifications. The company's associates—Brass Pressings (London) Ltd., are exhibiting hot pressings in brass, bronze and copper; and Pattern Makers (Engineering) Co. Ltd., show pattern equipment and sand castings in a range of copper base and aluminium alloys.

Northern Aluminium Company Ltd.

Makers of Noral aluminium sheet, plate, treadplate, extrusions, tubing, forgings and castings, this company has been closely associated with every major shipbuilding application of aluminium in this country, and much of their stand illustrates this theme. One displayed example of Noral aluminium in shipbuilding is a section of MacGregor insulated hatch-cover, of a type now being fitted in three new Royal Mail Line vessels.

Other exhibits, demonstrating how Noral technical developments keep pace with engineering demands, include information on the very-low-temperature properties of aluminium, and on welding techniques and the welding services Noral can offer; examples of Noral aluminium in the nuclear energy field, bearings, tubes for heat-exchangers, and details of a new 12 ft.-wide rolling mill now being installed at the company's Rogerstone works.

Osmond, A. & S., Ltd.

This company is showing a representative range of their abrasive wheel cut-off machines for ferrous and non-ferrous material also several high speed sawing machines for non-ferrous sections. Some of the machines exhibited are general purpose

machines and others for straight cutting only at high production speeds. Two sizes of the "Osmond" de-burring machine are on view, these machines use worn abrasive wheels from the cutting-off machines as the grinding disc.

Pyrene Company Ltd.

Part of this firm's stand is devoted to their metal finishing processes. In this section are shown samples treated by the "Parkerizing" rust-proofing process, "Bonderizing" for bonding paint to metal surfaces, "Pyluminizing" for bonding paint to aluminium and its alloys and "Bonderite Bonderlube" for aiding cold-forming. Also represented will be ancillary industrial products including "Detac", "Pultac", "Preperite", "Pyroclean" and "Thermsavas".

Quasi-Arc Ltd.

This exhibit ranges over the latest developments in manual, semi-automatic and fully automatic arc-welding. Much of the equipment shown this year is completely new, and the exhibits are supported, as usual, by practical demonstrations of the most advanced manual and automatic welding techniques.

Reynolds Tube Company Ltd.

Featured on this stand are manipulated components in steel tubing and in aluminium alloy tubing and extrusions; welded tubular assemblies; fabricated assemblies incorporating steel tubing and sheet, and aluminium alloy tubing, sheet and extrusions; forged light-alloy lifeline stanchions; light and heavy flash-welded components in mild, stainless, and heat resisting steels, aluminium alloys, "Nimonic" alloys, titanium, and other rare metals; precision hollow extruded bodies in carbon and alloy steels and aluminium alloys.

Rozalex Ltd.

This company is exhibiting the full range of their specialized products for skin health and hygiene for protecting the skin and safeguarding against occupational skin diseases and to keep the hands in a clean and healthy condition. The restyled Rozalex Dispenser is also on show, which is specially designed for issuing a controlled and uncontaminated supply of Rozalex when and wherever required. New Barrier Creams are featured, which are developments from the continuous research by this company, each designed to combat specific hazards which have, hitherto, presented problems.

Sandwell Casting Co.

Principal features of this exhibit are aluminium sand castings, "Superfyne" aluminium sand castings, gravity and pressure die-castings in aluminium. Brass, gunmetal, phosphor bronze, aluminium bronze, manganese bronze and copper sandcastings. Brass gravity die-castings. Shellmoulded castings. Finished machined castings. Finished castings, polished, chrome plated, anodized, etc.

Shell-Mex & B.P. Ltd.

The company's stand on this occasion features illustrations of the many sea shells from which the company's speciality lubricants take their name. These sea shell mouldings will be accompanied by brief descriptions of the sea shell lubricants and their uses.

Sintering & Brazing Furnaces Ltd.

Manufacturers of industrial electric furnaces of all types including continuous sintering, brazing, powder reduction and bright annealing. High temperature sintering furnaces for temperatures up to 1,350°C. using "Push-Pull" (Patent No. 26126/55) boat conveyance system. Molybdenum furnaces, temperatures up to 1,800°C. Glass annealing kilns, truck kilns, forced air circulating ovens, vacuum ovens.

Stein Atkinson Vickers Hydraulics Ltd.

A representative selection of British-made Vickers-Detroit oil hydraulic pumps, motors, control valves, cylinders and steering boosters may be inspected, also photographic displays of typical applications of these units in the engineering and marine fields.

Suffolk Iron Foundry (1920) Ltd.

Exhibited here is a full range of 31 different types of Sifbronze low temperature oxy-acetylene welding rods (including two new rods in the Sifbronze range) and their appropriate fluxes, together with Sifbronze "Demon" light duty and general duty welding blowpipes, Demon cutting blowpipe and Sifbronze regulators on demonstration, together with a demonstration of the use of Sifbronze rings with Stanelco automatic flame brazing equipment, and the Colibri motor-driven cutting machine.

Tilghman's Ltd.

Exhibited is an automatic mechanical shot blast machine for descaling all types of sectional steel lengths and steel plate. This comprises a horizontal roller conveyor machine equipped with four centrifugal Wheelabrator units. Material to be cleaned is loaded on to the inlet conveyor and traversed through the shotblasting chamber where the scaled and corroded surface of the metal is bombarded by the abrasive blast streams, removing all surface contamination. The cleaned surface facilitates marking and punching and is ideally suited for welding and burning, and provides a permanent bonding key for subsequent protective coatings. In addition other more universal units for descaling and treating metal surfaces are exhibited.

Vaughan, Edgar, & Co. Ltd.

The Marine Division of this company features the "Houghto-Solv" range of products to eliminate sludge formation in oil-burning ships and to ensure rapid cleaning of cargo tanks prior to dry-docking where a high degree of cleanliness is indispensable. Specialized oils and compounds for the metal working industry are also in evidence, as well as "Vim" mechanical leathers.

Walterisation Co. Ltd.

Paint-bonding and rust-proofing processes for steel, cast iron, zinc and aluminium are shown on this stand. Phosphating processes for anti-wear and anti-scuffing, cold deformation, and extrusion of steel. Typical industrial products showing the application of the Walterisation processes; "Fasbond" for paint-bonding, "Walterisation" for rust-proofing, "Foscote R.S." for destroying rust, "Deran" for dissolving rust, "Walterisation L." for chemical oxidation of aluminium, and "Walterisation SPC" for cold spraying for paint-bonding.

Ward, Thos. W. Ltd.

As sole selling agents in the United Kingdom for FICEP Shearing Machinery the company is showing the following:—Model CGC 100 billet shearing machine, one of eight sizes available with capacities ranging from 1 in. to 8 in. square. Power feeding table is fitted to the machine exhibited. No. 25 combination shearing and punching machine, the largest of a range of five machines capable of shearing up to 1 in. thick. "Beton" B 32 portable bar shearing machine, capacity 1¼ in. bar, with foot controlled clutch, single or continuous stroking and adjustable blade opening. Five sizes are available covering a range of bars from 1 in. to 2⅜ in. Colt shearing, cropping and notching machine, capacity plates up to ⅜ in. thick, rounds 1¼ in. dia. A large range of hand lever operated punching and shearing machines.

Westinghouse Brake and Signal Co. Ltd.

On the Westinghouse stand the main emphasis is on the company's marine activities in the pneumatic control field. A controllable pitch propeller and a mock-up of a marine engine and gearbox, both controlled from a dummy bridge, are shown. A layout illustrating pneumatic control for excavators or dredgers is also shown together with a graduable control layout.

Vacu-Blast Ltd.

The Vacu-Blast mobile dust free shot blast machines incorporate a unique closed circuit system for abrasive feed and recovery of dust, debris and spent abrasive from the work surface. The machine provides for separation and cleaning of the abrasive and segregation of the dust and debris with final filtration of dust particles from the exhausted air. The exhibit includes the Major 130 NC, Major 130 NC Mark II (for use on Open Vacu-Blasting), Medium 50M, Junior 35J and a Holman Bros. Ltd., T36R air compressor. Several items of ancillary equipment are also exhibited including the high production gun for plate descaling, blast cabinets, attachments for plate edge cleaning and pipe cleaning, a selection of Vacu-Blast guns and various types of abrasive which can be used with Vacu-Blast machines.

Yorkshire Imperial Metals Ltd.

Exhibited on this stand are examples of the company's manufactures of solid drawn, seamless, tubes in copper, brass and special copper-base alloys, and bi-metal tubes; plates and tube plates in copper and copper-base alloys, and bi-metal plates; heavy metal presswork; hollow copper conductors and special drawn sections; cable soldering sockets; plastic tubes and fittings; "Yorkshire" capillary and "Instantor", "Kuterlite" and "Coneor" compression fittings and lead pipe and sheet. "Yorcalbro/Alumbro" (aluminium-brass), "Yorkshire 70/30 Cupro-Nickel/Kunifer 30" and other special tubes and tube plates for marine and power station condensers; tubes and plates for oil refining heat exchange equipment together with tubes in a wide range of alloys for auxiliary plant. "Yorcalbro/Alumbro" tubes and "Yorkshire" fittings for oil tanker heating coils. Tubes and fittings (capillary and compression) for engineering pipelines and "Polyorc BH" High Impact P.V.C. tubes and fittings for water and chemical engineering pipelines, etc.

Industrial News *Home and Overseas*

Golf Meeting

Preliminary notice is given of the annual golf meeting of the **Non-Ferrous Club,** which is to be held on Wednesday, June 17, at Stratford-on-Avon Golf Club. The meeting is open to all members of the club and to any others in the non-ferrous metals industry who may wish to participate.

The meeting will be followed by dinner at The Welcombe Hotel, Stratford-on-Avon.

Details of the meeting may be obtained from Mr. T. B. Taylor, E. A. Chalmers and Co. Ltd., Charles Henry Street, Birmingham, 12, or Mr. R. L. Deutsch, Deutsch and Brenner Limited, Harford Street, Birmingham, 19.

Nuclear Metal Resources

On Thursday, April 23, a Paper on "The Uranium and Thorium Resources of the Commonwealth" is being given by S. H. U. Bowie, B.Sc., M.I.M.M., at the **Royal Society of Arts,** John Adam Street, Adelphi, London, W.C.2. Mr. Bowie is with the Atomic Energy Division, Geological Survey of Great Britain. The meeting, which is at 5.15 p.m., will be presided over by Anton Gray, Senior Mining Adviser, Atomic Energy Authority.

Nuclear Energy Exports

One of the largest exhibits in the nuclear energy section of the International Samples Fair, to be held in Milan this week and next, is that of the **United Kingdom Atomic Energy Authority.** The exhibit covers some 3,500 ft^2, and will illustrate two widely different aspects of British work—the industrial development of power reactors for electricity production, and the extensive range of radioactive isotopes which the Authority supplies.

A number of the ways in which radioactive isotopes can be used will be displayed, including the ways in which these materials can be used for measuring devices, germ destruction, medical work, tracer work, radiology and light sources. The methods used to pack isotopes for despatch are being shown, together with illustrations of the global extent of Britain's sales.

Telephone Number Changed

The telephone number of the Bournemouth depot of **British Insulated Callender's Cables Limited** has been changed and is now Bournemouth 36223.

Volumetric Analysis

Benzoic acid P.V.S. is now available from **Hopkin and Williams Ltd.,** 14-17 St. Cross Street, London, E.C.1. Benzoic acid has been recommended as an alkalimetric standard in volumetric analysis by a number of workers, and has also been widely employed as a standard substance in calorimetry. For both purposes, purification by fractional freezing has been described, and the efficiency of the process has been thoroughly tested.

The development of zone refining techniques has made it possible to apply the principle of fractional freezing in a new and particularly effective way. Benzoic acid is ideally suited to purification by the "zone melting" process, and Benzoic acid P.V.S. is produced by the application of zone purification to Benzoic acid "Analar," which is over 99.9 per cent pure. The resulting product may be accepted as of 100 per cent purity.

Titanium at Corrosion Exhibition

A display of wrought titanium products will be shown by the Metals Division of **Imperial Chemical Industries Limited** at this year's Corrosion Exhibition, to be held at the New Horticultural Hall, London, from April 27-30, together with illustrations of the important part which I.C.I. titanium is playing in the chemical industry.

A working exhibit will show how, by the use of an impressed positive potential, the corrosion resistance of titanium can be increased to cover an even wider range of corrosive liquids.

Examples of platinum-coated titanium electrodes will also be on display. The cathodic protection of a steel pier immersed in seawater illustrates one application of the new electrodes.

Aluminium Balcony Fronts

A number of materials were considered for the decoration of the balconies in Dolphin Court, Hove, Sussex, and aluminium was eventually selected by the architects as combining physical lightness with interesting possibilities, from the fabricating aspect, of producing the appearance, as well as the fact, of lightness.

The pattern chosen (1 in. wide flutes at 2½ in. centres) admirably succeeds in this, and the smooth texture of the panels is an excellent foil for the various facing bricks used. The question of colour was an important one and the two colours used—a greenish-blue and a pale yellow—were not available in colour anodizing and, therefore, vitreous enamelling was used. This provides a finish combining high lustre with freedom from deterioration. Combined with aluminium, vitreous enamelling is said to be even more permanent; the bond between enamel and metal will resist minor damage.

The vitreous-enamelling work was carried out by **Ernest Stevens Ltd.,** of Cradley Heath, the panels were pressed by **William Rome (Fabrications) Ltd.,** of Glasgow, and the aluminium supplied by **The British Aluminium Company Ltd.**

One of the aluminium balcony fronts at Dolphin Court, Hove

Galvanizing in India

A modern galvanizing bath for use in their structural manufacturing shop at Bharatpur, is to be imported by The Central India Machinery Manufacturing Co. Ltd., Wagon and Structural Shop Division, Bharatpur.

Manufacturers interested in this enquiry should write direct to the Indian firm, which is considered to be a suitable connection by the Board of Trade. It would be appreciated if, at the same time, they would notify the United Kingdom Trade Commissioner, P.O. Box 815, Mercantile Bank Building, Mahatma Gandhi Road, Bombay, No. 1, that they have done so.

Metal Decay

In a "Science Survey" talk entitled "Metal-Life Saving," at 6.45 p.m. on Friday, May 1, in Network Three of the B.B.C., Dr. T. P. Hoar, of the Department of Metallurgy at Cambridge, will tell how science is dealing with the problem of losses by corrosion, and the necessary protection of metallic structures.

Non-Ferrous Club

In light vein, Mr. B. C. Davis (managing director of a chain of furniture stores) entertained his audience at the luncheon meeting of the **Non-Ferrous Club,** held at the Queen's Hotel, Birmingham, on Wednesday of last week, with a story of the growth from East end obscurity to national status of a hypothetical furniture manufacturer. Mr. Davis contrasted the "simple brotherhood" of the furniture

trade with the competitive atmosphere of the non-ferrous metals industry.

At this meeting a collection was taken on behalf of the National Society for the Prevention of Cruelty to Children, and the sum of £15 10s. 0d. was realized.

Exhibiting Overseas

In the British Pavilion at the Poznan International Fair, to be held in June next, **Wild-Barfield Electric Furnaces Ltd.** will be exhibiting a number of standard products. Additional to a selection of standard laboratory muffles will be a self-contained electrode salt bath—Model ESB69—and a resistance-heated vacuum furnace for laboratory use, Model 2904.

German Aluminium

West Germany's production of aluminium during February totalled 8,756 tons, compared with 9,753 tons in January, according to industry sources. Prospects for the industry were considered favourable by the sources, as demand for the metal had increased during the first two months of this year while modernization programmes promised lower prices. Greater use of foundry capacity and higher production were forecast by the sources for 1959. They said output of semi-manufactured aluminium goods rose in the first two months of this year to 28,078 tons, a 6·1 per cent increase compared with 1958.

International Film Congress

Representatives of documentary and scientific film organizations from many countries will meet at the 13th Congress of the **International Scientific Film Association,** to be held in London and Oxford from September 23 to October 2. It is expected that over two hundred films, covering research, medicine, education and popular science subjects will be screened during the Congress and its accompanying Festival. Further particulars may be obtained from the Association's office, 3 Belgrave Square, London, S.W.1.

Parliamentary News

By Our Lobby Correspondent

Mining Allowances.—In the course of his Budget speech, the Chancellor of the Exchequer announced that he had decided upon a general restoration of investment allowances in respect of capital expenditure becoming due and payable after April 7. The rates of investment allowance for the main classes of assets would be 20 per cent for new plant and machinery and 10 per cent for expenditure on the construction of industrial buildings. Those were the rates in force under the 1954 Finance Act. In addition, he proposed that expenditure on new plant and machinery should be eligible for a 10 per cent initial allowance, and expenditure on the construction of industrial buildings for a 5 per cent initial allowance. The two allowances together would take the place of the present initial allowances of 30 per cent on plant and machinery and 15 per cent on industrial building.

Capital expenditure on new mining works, which at present qualified for a 40 per cent initial allowance, would become entitled to a 20 per cent investment allowance plus a 20 per cent initial allowance.

Copper Exports to China.—Viscount Elibank asked the Government in the House of Lords whether they could state the quantity and value of manufactured copper products sold to China since the export of the metal to that country was first permitted as an exception to the embargo.

The Minister Without Portfolio, the Earl of Dundee, replied that exports of copper metal to China were never permitted as an exception to the embargo. Since the beginning of last year, when export licences were first made available for exports of copper wire to China, Britain's exports to China of copper semi-manufactures had amounted to £5·6 million. In the same period, her exports to China of metal manufactures of all kinds amounted to £600,000. Separate figures for copper manufactures were not available.

In a supplementary question, Viscount Elibank asked whether the figure of £5·6 million did not show the value to the exporting trades of this country of standing up to Washington both in the consultative Committee in Paris and at the higher levels, and thereby bringing out a reduction of the embargo.

In reply, the Earl of Dundee said that the matter was a little complicated. There was a distinction between copper metal, i.e. raw metal, copper wire, copper semi-manufactures, and copper manufactures, for which no separate figures were available. The figure he had given was for copper semi-manufactures, and the embargo on those had been removed in August, 1958. There had been a further relaxation in restrictions on exports in August of last year which applied to a much smaller class of goods.

Forthcoming Meetings

April 18—Institute of British Foundrymen. Newcastle Branch. Neville Hall, Westgate Road, Newcastle upon Tyne. Annual General Meeting, followed by "Foundry" film. 6 p.m.

April 21—Institute of British Foundrymen. Slough Section. Lecture Theatre, High Duty Alloys Limited, Slough. Annual General Meeting, followed by "Modern Developments in Sand Practice." W. B. Parkes. 7.30 p.m.

April 22—Institute of British Foundrymen. Birmingham Branch. James Watt Memorial Institute, Great Charles Street, Birmingham, 3. Annual General Meeting, followed by "Discussion on a Casting Project"; introduced by S. N. Wrightson. 7.15 p.m.

April 22—Institute of British Foundrymen. London Branch. Constitutional Club, Northumberland Ave., London, W.C.2. Annual General Meeting, followed by "Water-Cooled Basic-Cupola Practice." T. C. Wilson. 7 p.m.

April 23—Institute of British Foundrymen. Northampton and District Section. The Plough Hotel, Northampton. Annual General Meeting, followed by "Some Practical Experiences in Making Moulds in a Mechanized Foundry." H. Pinchin. 7.30 p.m.

April 24—Institute of British Foundrymen. Bristol and West of England Branch. Royal Hotel, Bristol. Annual General Meeting. 7.30 p.m.

Men and Metals

A newly-created post of Scientific Attaché to the British Embassy in Moscow is to be filled by the appointment of **Mr. D. A. Senior,** M.A., A.M.I.E.E., to that position. He will advise the British Ambassador on scientific matters and report on Soviet scientific and technical development in the civil field. Mr. Senior will hold the rank of Senior Principal Scientific Officer and will be on the staff of the Department of Scientific and Industrial Research.

On Wednesday of last week, **Mr. W. H. McFadzean** took office as President of the Federation of British Industries for the ensuing year. Mr.

McFadzean has been chairman and managing director of British Insulated Callender's Cables Limited since 1954.

It has been announced by Fawcett Preston and Company Limited that **Mr. C. Smith** has been appointed contacts manager in the electrical division, and **Mr. A. J. Taylor** as sales office manager.

Relinquishing his position as managing director of the National Research Development Corporation at the end of last month, the **Earl of Halsbury,** F.R.I.C., F.Inst.P., has joined the board of Sondes Place Research Institute.

A native of Uddingston, near Glasgow, **Mr. S. M. Orr** has been appointed works manager of the pipe fabrication division of Steels Engineering Installations Limited, the Sunderland manufacturing engineers.

After ten years as senior research engineer with the British Hydromechanics Research Association, Dr. **D. F. Denny** has been appointed to the position of chief technical executive responsible for design and development of the range of products of Pratt Precision Hydraulics Limited.

Changes have been announced in the board of Avo Limited, which recently became a member of the Metal Industries Limited group. Joining the board are **Sir Charles Westlake** (chairman of Metal Industries), **Mr. H. O. Houchen,** managing director of Brookhirst Igranic Limited, and **Mr. John Black,** a director of Metal Industries. Sir Charles becomes chairman of the board, with **Mr. J. H. Rawlings** as deputy chairman.

Metal Market News

WITH the exception of zinc, which was able to register a small gain for the current position, the base metals closed lower last week, and copper, in particular, looked decidedly sorry for itself. Actually, the close was above the worst, but with the custom smelters down to 33 cents and, even before this reduction, with dealers selling at that level, the outlook is not very bright. The high spot of the week was, of course, the Budget, which certainly imparted a cheerful note into dealings on the Stock Exchange, but this did not last very long, and was followed by a mild scare about the chances of a summer election. In metals, business is certainly far from brisk and there does not seem to be much chance of any improvement in the near future. So far as copper is concerned, there appears to have been a notable loss of confidence in the United States where, up to a few weeks ago, the speculative boom on Comex continued without a let up. Actually, the background is unchanged, for there is still a fifty-fifty chance that there will be a major strike at the half-year by the copper miners. Consumers in the States are stocking up copper, or at any rate it is generally supposed that they are, and if and when the strike does occur they should be reasonably well safeguarded against the effects of a stoppage. As we write, the statistical position at the end of March is not known, but it seems fairly safe to assume that, at any rate outside the United States, another increase in stocks of copper will be seen. The Tacoma strike continues and as yet there is no word of a settlement in this dispute, which has now lasted for some weeks. Last week also brought rumours of possible trouble at Noranda. In Chile, too, there is from time to time a hint of a dispute arising in the mining area, and no doubt if a strike did break out at any important centre of production, the London market would immediately respond.

As already mentioned, copper closed last week above the lowest, which was £242 10s. 0d., but even so, at £244 both positions there was a loss on the week of £7 10s. 0d. Trading in both cash and three months was active, the turnover being about 11,600 tons with Kerb dealing. Business in the States seems still to be fairly good, and from time to time optimistic forecasts are made of the future. Contrary to the recent tendency, L.M.E. stocks were reduced last week by 225 tons to 9,641 tons, but it is too early yet to say that the trend has been reversed. With production running at a high level and consumption said to be only moderately good, it is not unreasonable to expect that stocks in L.M.E. warehouses will increase. After all, the Metal Exchange is the right and proper place where surplus stocks should be delivered.

The trend in tin stocks continues, and last week saw a drop of 570 tons in the warehouse tonnage to 10,179 tons. Quiet conditions outside the Metal Exchange were reflected in an easier trend in values, but the tone was steady. On balance, cash and three months lost 30s. to close at £780 10s. 0d. and £784 respectively. Statistically, the position appears to be fairly sound. Lead fluctuated, but closed 12s. 6d. down for April and 10s. lower for July at £68 5s. 0d. and £69 15s. 0d. for the respective positions. On a turnover of 8,350 tons, zinc improved by 7s. 6d. to close at £71 17s. 6d. April, July being unchanged at £71 10s. 0d.

Birmingham

In the Midlands last month, unemployment fell by a further 5,284. This was the biggest improvement in a single month since the early summer of 1957. The total was reduced from 44,715 to 39,431. The fall has been accompanied by a marked decline in short-time working, the main industries showing improvement including motor vehicles, pottery, clothing, machine tools, ironfounding, non-ferrous metals, and iron and steel rolling. In Birmingham, unemployment fell from 11,742 to 11,533. The reaction of industrialists to the Budget concessions is generally favourable. It is felt that although some time may elapse before trade improvement matures, there is no doubt that industry has received a stimulus. Orders which were specifically held up pending the Budget announcement will be placed, and there will be more business because of lower purchase tax on cars and on domestic appliances, such as washing machines, spin dryers, television sets, etc.

The outlook for the steel trade is brightening, especially now that purchase tax has been lowered on many articles in which steel forms a basic element. An early revival in demand for light castings is also expected. Supplies of pig iron are adequate to take care of existing demands. Sheet mills are busy on work for the motor trade, and a substantial tonnage of plates is required for shipbuilding. The structural steel market continues quiet.

New York

Copper futures, after an early gain, lost some ground on week-end profit-taking. Custom smelters copper was quiet, with the undertone soft. The custom smelter price was reduced one cent to 35 cents a lb., with fair sales reported at that price. Meanwhile, demand for producer copper at 31½ cents continued active. Tin was softer and quiet. Lead and zinc were quiet. A leading zinc seller said expectations of lower zinc price was hindering demand for Prime Western, with sellers holding off.

In the U.S. House of Representatives, a special sub-committee of the House Interior Committee declared that the plight of lead and zinc miners in Oklahoma, Kansas and Missouri had "gone from bad to worse." The sub-committee further said that all available unemployment compensation for the area had been used, and many miners' families were on relief. It noted that the Secretary of the Interior, Mr. Fred Seaton, had recently said that his Department was considering a recommendation that President Eisenhower extend lead-zinc import quotas, established last September, to include products of the two metals. The sub-committee promised that a formal report would be submitted to the full committee within a few days.

Buenos Aires

The Argentine Government is studying the modification of import duties, and revised lists are expected to be issued in the near future, according to usually well-informed sources. The sources said the modifications would affect such items as copper, aluminium, lead and gold ingots, as well as List Three imports. The duties on industrial raw materials such as soda would also be modified.

Zurich

Turnover declined slightly on the Swiss precious metal market in the past week, mainly as a result of seasonal reduced purchases by jewellers. Industrial demand for gold and silver is still, however, very active. Lack of interest persists in platinum and palladium.

Offerings of platinum and silver were again somewhat reduced during the week. Consequently, the price of these two metals went up.

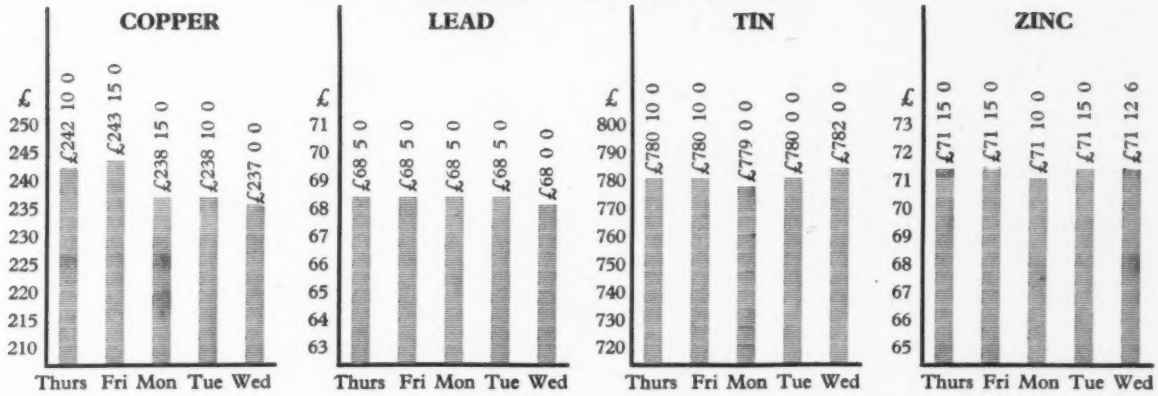
Oslo

It is reported from Oslo that the Norwegian Government-owned aluminium plants, Ardal and Sunndal Verk A/S, will, in a few years' time, when existing expansion plans have been realized, produce 160,000 tons annually. This will have an estimated value of 500 million kroner (£25 million) and give an export surplus of 300 million kroner (£15 million). Last year's output reached a total of 71,000 tons. A number of the 132 electrolytic smelting furnaces, the current Ardal II expansion programme, have just been started up. The programme will, when completed by the end of the year, step up production by some 36,000 tons annually.

Non-Ferrous Metal Prices

London Metal Exchange

Thursday 9 April to Wednesday 15 April 1959



Primary Metals

All prices quoted are those available at 2 p.m. 15/4/59

		£	s.	d.
Aluminium Ingots	ton	180	0	0
Antimony 99·6%	„	197	0	0
Antimony Metal 99%	„	190	0	0
Antimony Oxide	„	180	0	0
Antimony Sulphide Lump	„	190	0	0
Antimony Sulphide Black Powder	„	205	0	0
Arsenic	„	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	„		9	0
Calcium	„	2	0	0
Cerium 99%	„	16	0	0
Chromium	„		6	11
Cobalt	„		14	0
Columbite	per unit		—	
Copper H.C. Electro	ton	237	0	0
Fire Refined 99·70%	„	236	0	0
Fire Refined 99·50%	„	235	0	0

		£	s.	d.
Copper Sulphate	ton	79	0	0
Germanium	grm.		—	
Gold	oz.	12	9	0¾
Indium	„		10	0
Iridium	„	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	68	0	0
Magnesium Ingots	lb.		2	3
Notched Bar	„		2	9½
Powder Grade 4	„		6	1
Alloy Ingot, A8 or AZ91	„		2	4
Manganese Metal	ton	245	0	0
Mercury	flask	79	0	0
Molybdenum	lb.	1	10	0
Nickel	ton	600	0	0
F. Shot	lb.		5	5
F. Ingot	„		5	6
Osmium	oz.		nom.	
Osmiridium	„		nom.	

		£	s.	d.
Palladium	oz.	7	5	0
Platinum	„	28	10	0
Rhodium	„	40	0	0
Ruthenium	„	14	0	0
Selenium	lb.		nom.	
Silicon 98%	ton		nom.	
Silver Spot Bars	oz.		6	7⅛
Tellurium	lb.		15	0
Tin	ton	782	0	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	„		—	
Virgin Min 98%	„	71	11	3
Dust 95/97%	„	109	0	0
Dust 98/99%	„	115	0	0
Granulated 99+%	„	96	11	3
Granulated 99·99+%	„	109	11	3

**Duty and Carriage to customers' works for buyers' account.*

Foreign Quotations

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

	Belgium fr/kg ≏£/ton	**Canada** c/lb ≏£/ton	**France** fr/kg ≏£/ton	**Italy** lire/kg ≏£/ton	**Switzerland** fr/kg ≏£/ton	**United States** c/lb ≏£/ton
Aluminium		22.50 185 17 6	224 163 0	375 221 5	2.50 212 10	26.80 214 10
Antimony 99.0			220 165 0	445 262 10		29.00 232 0
Cadmium			1,350 1,012 10			130.00 1,040 0
Copper						
Crude						
Wire bars 99.9				490 289 2 6		
Electrolytic	34.25 252 0	30.50 252 0	344 258 0		3.05 295 5 0	31.50 252 0
Lead		10.25 84 12 6	100 75 0	164 96 15	.87 74 0	11.00 88 0
Magnesium						
Nickel		70.00 578 5	900 675 0	1,200 708 0	7.50 637 10	74.00 592 0
Tin	111.00 817 2 6		1,119 799 5	1,500 885 0	9.60 816 0	102.50 820 0
Zinc						
Prime western		10.75 88 15 0				11.00 88 0
High grade 99.95		11.35 93 15 0				
High grade 99.99		11.75 97 0 0				
Thermic			107.00 80 5			
Electrolytic			115.00 86 5	165 97 7 6	.99 84 2 6	12.25 98 0

Non-Ferrous Metal Prices (continued)

Ingot Metals

All prices quoted are those available at 2 p.m. 15/4/59

Aluminium Alloy (Virgin)	£	s.	d.
B.S. 1490 L.M.5 .... ton	210	0	0
B.S. 1490 L.M.6 .... „	202	0	0
B.S. 1490 L.M.7 .... „	216	0	0
B.S. 1490 L.M.8 .... „	203	0	0
B.S. 1490 L.M.9 .... „	203	0	0
B.S. 1490 L.M.10.... „	221	0	0
B.S. 1490 L.M.11.... „	215	0	0
B.S. 1490 L.M.12.... „	223	0	0
B.S. 1490 L.M.13.... „	216	0	0
B.S. 1490 L.M.14.... „	224	0	0
B.S. 1490 L.M.15.... „	210	0	0
B.S. 1490 L.M.16.... „	206	0	0
B.S. 1490 L.M.18.... „	203	0	0
B.S. 1490 L.M.22.... „	210	0	0
†Aluminium Alloys (Secondary)			
B.S. 1490 L.M.1 .... ton	—		
B.S. 1490 L.M.2 .... „	—		
B.S. 1490 L.M.4 .... „	—		
B.S. 1490 L.M.6 .... „	—		
***Aluminium Bronze**			
BSS 1400 AB.1..... ton	—		
BSS 1400 AB.2..... „	241	0	0

*Brass	£	s.	d.
BSS 1400-B3 65/35 .. ton	159	0	0
BSS 249 ..... „	168	0	0
BSS 1400-B6 85/15 .. „	207	0	0
***Gunmetal**			
R.C.H. 3/4% ton .... „	—		
(85/5/5/5) ..... „	197	0	0
(86/7/5/2) ..... „	207	0	0
(88/10/2/1) ..... „	249	0	0
(88/10/2/½) ..... „	266	0	0
***Manganese Bronze**			
BSS 1400 HTB1.... „	202	0	0
BSS 1400 HTB2.... „	—		
BSS 1400 HTB3.... „	227	0	0
Nickel Silver			
Casting Quality 12% „	220	0	0
„ „ 16% „	230	0	0
„ „ 18% „	240	0	0
***Phosphor Bronze**			
B.S.1400 P.B.1.(A.I.D. released) ..... „	292	0	0
B.S. 1400 L.P.B.1.... „	215	0	0

**Average prices for the last week-end.*

Phosphor Copper	£	s.	d.
10% ..... ton	261	0	0
15% ..... „	263	0	0
Phosphor Tin			
5% ..... „	—		
Silicon Bronze			
BSS 1400-SB1 ..... „	255	0	0
Solder, soft, BSS 219			
Grade C Tinmans.... „	362	5	0
Grade D Plumbers.. „	291	0	0
Grade M ..... „	397	15	0
Solder, Brazing, BSS 1845			
Type 8 (Granulated) lb.	—		
Type 9 „ „	—		
Zinc Alloys			
Mazak III ..... ton	102	16	3
Mazak V ..... „	106	16	3
Kayem ..... „	112	16	3
Kayem II ..... „	118	16	3
Sodium-Zinc ..... lb.		2	6

Semi-Fabricated Products

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products.

Aluminium						
Sheet	10	S.W.G.	lb.	2	8½
Sheet	18	S.W.G.	„	2	10½
Sheet	24	S.W.G.	„	3	1½
Strip	10	S.W.G.	„	2	8½
Strip	18	S.W.G.	„	2	9½
Strip	24	S.W.G.	„	2	11
Circles	22	S.W.G.	„	3	2½
Circles	18	S.W.G.	„	3	1½
Circles	12	S.W.G.	„	3	0½
Plate as rolled			„	2	8
Sections			„	3	2
Wire 10 S.W.G.			„	2	11½
Tubes 1 in. o.d. 16 S.W.G.			„	4	1
Aluminium Alloys					
BS1470. HS10W.					
Sheet	10	S.W.G.	„	3	1
Sheet	18	S.W.G.	„	3	3½
Sheet	24	S.W.G.	„	3	11
Strip	10	S.W.G.	„	3	1
Strip	18	S.W.G.	„	3	2½
Strip	24	S.W.G.	„	3	10½
BS1477. HP30M.					
Plate as rolled.....			„	2	11
BS1470. HC15WP.					
Sheet	10	S.W.G.	„	3	9½
Sheet	18	S.W.G.	„	4	2
Sheet	24	S.W.G.	„	5	0½
Strip	10	S.W.G.	„	3	10½
Strip	18	S.W.G.	„	4	2
Strip	24	S.W.G.	„	4	9½
BS1477. HPC15WP.					
Plate heat treated..			„	3	6½
BS1475. HG10W.					
Wire	10	S.W.G.	„	3	10½
BS1471. HT10WP.					
Tubes 1 in. o.d. 16 S.W.G.			„	5	0½
BS1476. HE10WP.					
Sections			„	3	1½
Brass					
Tubes.....			„	1	10⅜
Brazed Tubes.....			„	—	
Drawn Strip Sections			„	—	
Sheet			ton	—	
Strip			„	256	15	0
Extruded Bar.....			lb.	2	0½
Extruded Bar (Pure Metal Basis)			„	—	

Brass					
Condenser Plate (Yellow Metal)		ton	193	0	0
Condenser Plate (Naval Brass)		„	205	0	0
Wire		lb.		2	8
Beryllium Copper					
Strip		„	1	4	11
Rod.....		„	1	1	6
Wire		„	1	4	9
Copper					
Tubes		lb.		2	3¾
Sheet		ton	269	10	0
Strip		„	269	10	0
Plain Plates		„	—		
Locomotive Rods		„	—		
H.C. Wire		„	293	15	0
Cupro Nickel					
Tubes 70/30		lb.		3	7½

Lead					
Pipes (London)		ton	108	5	0
Sheet (London)		„	106	0	0
Tellurium Lead		„	£6 extra		
Nickel Silver					
Sheet and Strip 7% ..		lb.		3	9½
Wire 10%		„		4	4
Phosphor Bronze					
Wire		„		4	1⅛
Titanium (1,000 lb. lots)					
Billet over 4″ dia.-18″ dia.		lb.	63/-		64/-
Rod 4″ dia.-·250″ dia.		„	75/-		112/-
Wire under ·250″ dia.-·036″ dia.		„	146/-		222/-
Sheet 8′ × 2′ × ·250″-·010″			88/-		157/-
Strip ·048″-·003″.....		„	100/-		350/-
Tube.....		„			300/-
Extrusions		„			120/-
Zinc					
Sheet		ton	106	15	0
Strip		„	nom.		

Domestic and Foreign

Merchants' average buying prices delivered, per ton, 14/4/59.

Aluminium	£
New Cuttings	146
Old Rolled	126
Segregated Turnings	97
Brass	
Cuttings	160
Rod Ends	141
Heavy Yellow	124
Light	119
Rolled	150
Collected Scrap	122
Turnings	134
Copper	
Wire	211
Firebox, cut up	206
Heavy	203
Light	198
Cuttings	211
Turnings	192
Braziery	172

Gunmetal	£
Gear Wheels	183
Admiralty.....	183
Commercial	165
Turnings	160
Lead	
Scrap	58
Nickel	
Cuttings	—
Anodes	550
Phosphor Bronze	
Scrap	165
Turnings	160
Zinc	
Remelted	60
Cuttings	53
Old Zinc	37

Financial News

British Aluminium Co. Ltd.

Trading profits of the group declined from £3,020,706 to £2,105,394 in 1958, after depreciation of £844,848 (£810,165) and transferring £120,000 (£200,000) to plant replacement reserve. After taxation, the net profit is shown at £1,030,242 (£1,247,389). Dividend is 17½ per cent.

Josiah Parkes and Sons

Group net profits are shown at £160,268 (£133,107) after taxation. General reserve £75,000; carry forward is £167,201. Dividend is 15 per cent.

Projectile and Engineering Co. Ltd.

Group net profit is shown at £84,466. Balance forward is increased from £15,989 to £71,230. Dividend recommended at 6 per cent.

Pyrene-Panorama Co.

This is a new company, with a nominal capital of £50,000, formed by The Pyrene Company as a wholly-owned subsidiary. The new company will take over as a going concern from Panorama Equipment, Panorama Equipment and Industrial Protection.

William Bate (Holdings)

Group net profit, 1958, £92,088 (£75,465). Distribution 35 per cent (same) and scrip issue of one 7 per cent Cumulative Second Preference £1 share for every five Ordinary 4s. shares. Current assets £506,882 (£445,378), liabilities £232,256 (£225,835). Reserves £281,439 (£219,970). Future tax £95,000 (£77,500).

Ferrous Castings Ltd.

It has been announced, with great regret, by Metal Industries Limited, that it is closing one of its smaller subsidiaries, Ferrous Castings Ltd., of Warrington. The company, which was founded in 1919, manufactures iron castings for the engineering and electrical trades.

The closure will not take place until July, and £14,000 is being set aside for final payments to the company's 125 employees over and above their normal salaries or wages. Adverse trading conditions, coupled with a continued decline in the use of grey iron castings by companies within the group, have involved Ferrous Castings in substantial losses over a period.

Sir Charles Westlake, chairman of Metal Industries, has made it clear that the decision to close the company "in no way reflects upon the management, staff or workpeople."

British Timken

Dividend 10 per cent for 1958 on capital increased by scrip issue (total equivalent 8 per cent, interim on capital prior to rights issue). Group net profit £1,060,671 (£872,681), after U.K. tax £921,846 (£903,087). Profit of holding company £1,019,423 (£802,738). To general reserve £655,525 (£435,000 and contingencies £100,000). Forward holding company, including tax credit £40,923, £357,271 (£281,700).

Enfield Cables

No dividend for 1958 (2½ per cent). Profit £33,472 (£90,670), before tax of £16,884 (£30,520). To debenture sinking fund £12,689 (£13,292), set aside for price fluctuations £6,000 (nil), forward £80,533 (£104,196).

Enfield Rolling Mills

Group net profit, 1958, £737,725 (£632,750), and dividends 15 per cent (12½ per cent). Fixed assets £2,158,617 (£1,905,108) and investments £648,848 (£648,849), including Government securities £595,268 (same), with market value £640,864 (£596,742). Net current assets £6,387,600 (£6,225,387), including cash £76,420 (£1,292,405, tax certificates £385,000, bills receivable £649,225), overdraft £632,644 (£91,118), and revaluing acceptance credit £210,000 (nil). Future tax £630,000 (£575,000). Commitments £392,032.

New Companies

The particulars of companies recently registered are quoted from the daily register compiled by Jordan and Sons Limited, Company Registration Agents, Chancery Lane, W.C.2.

A. G. Warren and Son Ltd. (623606), 29 Malvern Hill Road, Nechells, Birmingham, 7. Registered March 19, 1959. To carry on business of electroplaters in silver, copper, brass or nickel, cadmium and chromium, etc. Nominal capital, £10,000 in £1 shares. Directors: Aubrey G. Warren, John P. D. Warren, Mrs. Norah K. Warren and Mrs. Joan Warren.

Brass Finishers (London) Ltd. (623820) 70 Wimpole Street, W.1. Registered March 23, 1959. Nominal capital, £100 in £1 shares. Directors: Leon Phillips and George A. Penney.

Moderncast Foundries Ltd. (623871), 71 Stomp Road, Burnham, Bucks. Registered March 23, 1959. Nominal capital, £5,000 in £1 shares. Directors: Charles Green, Kenneth A. Robbins, Harold V. Beard and Roger F. Way.

Tube-Bar Grinding Limited (624110), Balds Lane, Wollescote, Worcester. Registered March 25, 1959. To carry on business of mechanical engineers, etc. Nominal capital, £500 in £1 shares. Directors not named.

Quality Kast Limited (624200), Chancery House, Chancery Lane, W.C.2. Registered March 25, 1959. To carry on business of manufacturers of and dealers in castings and metal and plastics goods, etc. Nominal capital, £100 in £1 shares. Directors to be appointed by subscribers.

Scrap Metal Prices

The figures in brackets give the English equivalents in £1 per ton:—

West Germany (D-marks per 100 kilos):		
Used copper wire	(£210.5.0)	240
Heavy copper	(£208.10.0)	238
Light copper	(£175.5.0)	200
Heavy brass	(£113.17.6)	130
Light brass	(£92.0.0)	105
Soft lead scrap	(£57.0.0)	65
Zinc scrap	(£36.15.0)	42
Used aluminium unsorted	(£83.5.0)	95
France (francs per kilo):		
Electrolytic copper scrap	(£198.15.0)	265
Heavy copper	(£198.15.0)	265
No. 1 copper wire	(£187.10.0)	250
Light brass	(£116.5.0)	155
Zinc castings	(£49.10.0)	66
Lead	(£63.15.0)	85
Aluminium	(£120.0.0)	160

Italy (lire per kilo):		
Aluminium soft sheet clippings (new)	(£197.12.6)	335
Aluminium copper alloy	(£126.17.6)	215
Lead, soft, first quality	(£75.12.6)	128
Lead, battery plates	(£41.17.6)	71
Copper, first grade	(£227.2.6)	385
Copper, second grade	(£215.7.6)	365
Bronze, first quality machinery	(£212.10.0)	360
Bronze, commercial gunmetal	(£183.0.0)	310
Brass, heavy	(£147.10.0)	250
Brass, light	(£132.15.0)	225
Brass, bar turnings	(£135.15.0)	230
New zinc sheet clippings	(£56.0.0)	95
Old zinc	(£41.7.6)	70

Light Metal Statistics

Figures showing the U.K. production, etc., of light metals for Jan. 1959, have been issued by the Ministry of Supply as follows (in long tons):—

Virgin Aluminium	
Production	2,094
Imports	17,464
Despatches to consumers	18,613
Secondary Aluminium	
Production	9,251
Virgin content of above	809
Despatches (including virgin content)	9,820
Scrap	
Arisings	11,160
Estimated quantity of metal recoverable	7,736
Consumption by:	
(a) Secondary smelters	11,031
(b) Other uses	1,192
Despatches of wrought and cast products	
Sheet, strip and circles	12,540
Extrusions (excluding forging bar, wire-drawing rod and tube shell):	
(a) Bars and sections	2,870
(b) Tubes (i) extruded	139
(ii) cold drawn	553
(c) (i) Wire	2,261
(ii) Hot rolled rod (not included in (c) (i)	18
Forgings	304
Castings: (a) Sand	1,637
(b) Gravity die	4,051
(c) Pressure die	1,646
Foil	1,990
Paste	223
Magnesium Fabrication	
Sheet and strip	9
Extrusions	96
Castings	138
Forgings	5

THE STOCK EXCHANGE

A Fairly Strong But Selective Demand Reported For Engineering and Non-Ferrous Metal Shares

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 14 APRIL	+RISE—FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1959 HIGH	1959 LOW	1958 HIGH	1958 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	26/–	—1/–	9	10	6 18 6	27/–	23/3	24/9	17/6
400,000	2/–	Anti-Attrition Metal	1/6		4	8½	5 6 9	—	—	1/9	1/3
41,305,038	Stk. (£1)	Associated Electrical Industries ...	60/3	+2/9	15	15	4 19 6	60/3	54/–	58/9	46/6
1,609,032	1	Birfield	48/6	+6d.	15	15	6 3 9	59/–	47/6	62/4½	46/3
3,196,667	1	Birmid Industries	75/–	+1/–	17½	17½	4 13 3	76/10½	72/–	77/6	55/3
5,630,344	Stk. (£1)	Birmingham Small Arms	39/9	+9d.	11	10	5 10 9	40/4½	36/1½	39/–	23/9
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	16/3		5	5	6 3 0	16/3	15/–	16/1½	14/7½
350,580	Stk. (£1)	Ditto Cum. B. Pref. 6%	17/9		6	6	6 15 3	18/1½	17/9	17/4½	16/6
500,000	1	Bolton (Thos.) & Sons	27/6		10	12½	7 5 6	28/3	27/6	28/9	24/–
300,000	1	Ditto Pref. 5%	15/6		5	5	6 9 0	15/6	15/–	16/–	15/–
160,000	1	Booth (James) & Co. Cum. Pref. 7%	20/6		7	7	6 16 6	—	—	20/4½	19/–
1,500,000	Stk. (£1)	British Aluminium Co. Pref 6% ...	19/6		6	6	6 3 0	19/7½	18/9	20/–	18/4½
15,000,000	Stk. (£1)	British Insulated Callender's Cables	53/–	+4/–	12½	12½	4 14 3	53/–	47/6	52/6	38/9
17,047,166	Stk. (£1)	British Oxygen Co. Ltd., Ord. ...	54/6		10	10	3 13 6	56/–	49/3	52/–	28/3
600,000	Stk. (5/–)	Canning (W.) & Co.	28/6	+2/9	25+ *2½C	25	4 7 9	28/6	24/9	25/3	19/3
60,484	1/–	Carr (Chas.)	1/10½	—1½d.	12½	25	6 13 3	2/3	1/3	2/3	1/4½
150,000	2/–	Case (Alfred) & Co. Ltd.	5/–		25	25	10 0 0	5/3	4/7½	5/3	4/–
555,000	1	Clifford (Chas.) Ltd.	23/–	+6d.	10	10	8 14 0	23/–	22/6	22/–	16/–
45,000	1	Ditto Cum. Pref. 6%	15/3		6	6	7 17 6	—	—	16/–	15/–
250,000	2/–	Coley Metals	3/4½		20	25	11 17 0	3/4½	2/10½	4/6	2/6
8,730,596	1	Cons. Zinc Corp.†	60/–	—1/6	18‡	22½	6 5 0	67/6	60/–	65/3	41/–
1,509,528	1	Davy & United	96/–	+1/–	20	15	4 3 3	96/–	86/–	87/–	45/9
2,915,000	5/–	Delta Metal	33/3	+1/6	31	30	4 13 3	33/3	24/1½	25/–	17/7½
4,620,000	Stk. (£1)	Enfield Rolling Mills Ltd.	47/–	+6d.	15	12½	6 7 9	48/–	36/7½	38/–	22/9
750,000	1	Evered & Co.	31/6		10 §	15 Z	6 7 0	31/6	30/–	30/–	26/
13,000,000	Stk. (£1)	General Electric Co.	34/–	—1/–	10P	12½		40/3	30/9	40/6	29/6
1,500,000	Stk. (10/–)	General Refractories Ltd.	34/3	+3d.	20	20	5 16 9	40/–	33/9	39/3	27/3
401,240	1	Gibbons (Dudley) Ltd.	64/–		15	15	4 13 6	66/6	64/–	67/6	61/–
750,000	5/–	Glacier Metal Co. Ltd.	6/9		11½	11½	8 10 3	7/1½	6/7½	8/3	5/–
1,750,000	5/–	Glynwed Tubes	17/6		20	20	5 14 3	19/3	16/4½	18/1½	12/10½
5,421,049	10/–	Goodlass Wall & Lead Industries ...	32/9	+6d.	13‖	18Z	3 19 6	32/9	28/7½	30/9	17/3
342,195	1	Greenwood & Batley	81/–	+1/6	20	17½	4 18 9	83/9	75/–	57/9	45/–
396,000	5/–	Harrison (B'ham) Ord.	18/1½	—6d.	*17½	*15	4 16 6	18/7½	14/11½	15/9	11/6
150,000	1	Ditto Cum. Pref. 7%	19/6		7	7	7 3 6	—	—	19/9	18/4½
1,075,167	5/–	Heenan Group	8/6	+6d.	10	10‡	5 17 9	8/6	7/6	9/7½	6/9
236,958,260	Stk. (£1)	Imperial Chemical Industries ...	34/10½	+10½d.	12Z	10	4 11 9	38/3	33/9	38/–	24/3
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	17/–	+3d.	5	5	5 17 9	17/–	16/–	17/1½	16/–
14,584,025	••	International Nickel	162½	—4	$2.60	$3.75	2 16 9	171	153	169	132½
860,000	5/–	Jenks (E. P.), Ltd.	10/–	+3d.	14	27½ ϕ	7 0 0	10/–	8/9	10/–	6/7½
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	16/3		5	5	6 3 0	16/3	15/4½	16/9	15/–
3,987,435	1	Ditto Ord.	47/–		10	10	4 5 0	52/6	44/3	47/–	36/6
600,000	10/–	Keith, Blackman	27/6		17½E	15	6 7 3	27/6	25/–	28/9	15/–
320,000	4/–	London Aluminium	6/–	—1½d.	10	10	6 13 3	6/4½	5/3	6/–	3/–
765,012	1	McKechnie Brothers Ord.	42/6		15	15	7 1 3	45/–	42/6	45/–	32/–
1,530,024	1	Ditto A Ord.	40/–		15	15	7 10 0	43/6	42/–	45/–	30/–
1,103,268	5/–	Manganese Bronze & Brass	15/6		20	27½‡	6 9 0	15/6	13/9	14/1½	8/9
50,628	6/–	Ditto (7½% N.C. Pref.)	6/–		7½	7½	7 10 0	—	—	6/3	5/6
13,098,855	Stk. (£1)	Metal Box	77/6	—1/3	11	11	2 16 9	78/9	66/6	73/3	40/6
415,760	Stk. (2/–)	Metal Traders	9/6	—3d.	50	50	10 10 6	9/9	8/4½	9/–	6/3
160,000	1	Mint (The) Birmingham	23/3	+3d.	10	10	8 12 0	23/3	22/–	22/9	19/–
80,000	5	Ditto Pref. 6%	72/6		6	6	8 5 6	75/6	69/–	83/6	69/–
3,705,670	Stk. (£1)	Morgan Crucible A	46/–	+6d.	10	10	4 7 0	46/–	43/6	45/–	34/–
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	17/6		5½	5½	6 5 9	18/6	17/6	18/–	17/–
2,200,000	Stk. (£1)	Murex	48/3	—1/9	17½	20	7 5 0	50/–	42/–	58/9	46/–
468,000	5/–	Ratcliffs (Great Bridge) ...	11/6	+9d.	10R	10	4 7 0	11/6	10/4½	11/1½	6/10½
234,960	10/–	Sanderson Bros. & Newbould ...	30/–		20	27½D	6 13 3	30/–	27/9	27/3	24/6
1,365,000	Stk. (5/–)	Serck	20/–	+9d.	15	17½	3 15 0	20/–	18/–	18/7½	11/–
6,698,586	Stk. (£1)	Stone-Platt Industries	47/–	+1/9	15	12½	6 7 9	47/–	43/3	45/6	22/6
2,928,963	Stk. (£1)	Ditto 5½% Cum. Pref.	17/–	+6d.	5½	5½	6 9 6	17/–	15/10½	16/3	12/7½
18,255,218	Stk. (£1)	Tube Investments Ord.	82/6	—6d.	17½	15	4 4 6	83/3	72/–	86/–	48/4½
41,000,000	Stk. (£1)	Vickers	33/–		10	10	6 1 3	37/–	30/6	36/3	28/9
750,000	Stk. (£1)	Ditto Pref. 5%	14/6		5	5	6 18 0	15/0‡	14/6	15/9	14/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	21/6	—6d.	*5	*5	7 3 3A	22/7½	21/6	23/–	21/3
2,200,000	1	Ward (Thos. W.), Ord.	87/6		20	15	4 11 6	87/6	83/6	87/3	70/9
2,666,034	Stk. (£1)	Westinghouse Brake	43/6	+6d.	10	10	4 12 0	47/–	39/9	46/6	32/6
225,000	2/–	Wolverhampton Die-Casting ...	10/3	—1½d.	30	25	5 17 0	10/6	8/8½	10/1½	7/–
591,000	5/–	Wolverhampton Metal	24/–	+3d.	27½	27½	5 14 6	24/–	21/6	22/9	14/9
78,465	2/6	Wright, Bindley & Gell	6/6		20	20	7 13 9	6/7½	4/11½	5/4½	2/9
124,140	1	Ditto Cum. Pref. 6%	13/9		6	6	8 14 6	13/9	13/6	13/–	11/3
150,000	1/–	Zinc Alloy Rust Proof	3/–		27	40D	9 0 0	3/–	2/9	3/1½	2/7½

•Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting ••Shares of no Par Value. ‡ and 100% Capitalized Issue. •The figures given relate to the issue quoted in the third column. A Calculated on £7 14 6 gross. Y Calculated on 11½% dividend. ‖Adjusted to allow for capitalization issue. E for 15 months. D and 50% capitalized issue. Z and 50% capitalized issue. B equivalent to 12½% on existing Ordinary Capital after 100% capitalized issue. ϕ And 100% capitalized issue. X Calculated on 17½%. C Paid out of Capital Profits. E and 50% capitalized issue in 7% 2nd Pref. Shares. P Interim dividend since reduced. § And Special distribution of 2½% free of tax. R And proposed 33⅓% capitalized issue in 8% Maximum Ordinary 5/– Stock Units.

For the business that's growing

***THIS** is the Barrel Plater!*

THE SILVERCROWN
TIB UNIT

A TWO-STAGE UNIT
THAT CAN BE EXTENDED INTO
A FULL "SEMI-AUTOMATIC" LINE

The basic unit consisting of one horizontal, totally immersed plating barrel, one plating tank fitted with rails, load and unload position and trolley and hoist, is competitive in price with any other single unit on the market, offers all the advantages of the TIBMATIC Equipment and can easily be operated by one man. It is possible to add one or more tanks for swilling, pre-treatment or after treatment and build up a line which is truly semi-automatic, as the barrel with work is moved from tank to tank by the one operator. Consequently the additional expense is merely the cost of extra tanks and rail sections. When the number of tanks or quantity of work justifies, additional barrel containers can be added to work with the existing tanks.

Furthermore the trolley and barrel can be removed and the solutions adjusted to leave a line of still tanks which represents true flexibility to the outplater or small manufacturer. TIBMATIC Units are eminently suited for plating Bright Nickel, Bright Zinc, Bright Cadmium, etc.

SILVERCROWN LIMITED

Head Office: 178-180 GOSWELL ROAD, LONDON, E.C.1. CLErkenwell 2291 (10 lines)
Chemical Works & Laboratories: GONSALVA ROAD, LONDON, S.W.8. MACaulay 5575
Birmingham Branch: 96 MACDONALD STREET, BIRMINGHAM, 5. MIDland 7928/9
ALSO AT MANCHESTER, SHEFFIELD, LEEDS, NEWCASTLE AND GLASGOW

GATEWAY TO QUALITY

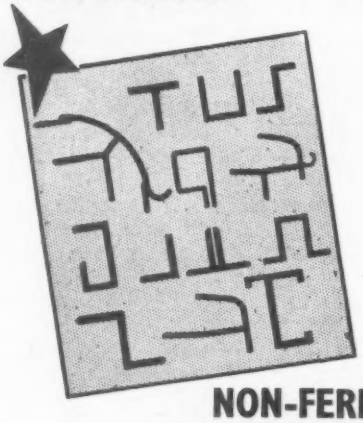
D

RE-MELTED SPELTER XXX BRAND

PRODUCED UNDER LABORATORY CONTROL
QUALITY GUARANTEED

DEUTSCH & BRENNER
LIMITED
HARFORD STREET, BIRMINGHAM, 19. Also at Cardiff & Manchester
Telephone: Northern 3838 (11 lines) Telex 33-374 · Cardiff 31833 · Gatley 6418

You may not understand
RUSSIAN OR CHINESE



but—
you will understand the value of our good service and competitive prices

for
NON-FERROUS METALS
including ALUMINIUM & ALLOYS, Sheets & Extrusions, BRASS, COPPER, RODS, BARS, TUBES, SHEETS, etc., DURALUMIN.
A.I.D. Approved

STEDALL AND COMPANY LTD
164 HIGH HOLBORN, LONDON, W.C.I. Temple Bar 1540
also at:-
UNION WKS, CARPENTER ST. MANCHESTER, 1 | 17 DOWNEND ROAD, FISHPONDS, BRISTOL | OLDBURY RD., ALBION WEST BROMWICH

SPECIALISTS
IN ALL GRADES OF NEW and OLD
NON-FERROUS SCRAP METALS
and
RESIDUES
Members of The National Association of Non-Ferrous Scrap Metal Merchants.

IMPORT
EXPORT

Arthur E.
Milner (METALS) LTD
DUNTON WORKS, KINGSBURY ROAD, CURDWORTH, BIRMINGHAM.
Tel.: Curdworth 52/53. Grams: Curdworth 52.
London Offices: 10, UNION COURT, OLD BROAD ST., E.C.2.
Tel.: LONdon Wall 6991/2. Cables: Milnamet, London.

Established 1840
Telephone: ASTon Cross 4881
Telegrams: "Levick, Phone, Birmingham"
JOHN LEVICK, LTD
METAL SPINNING WORKS
Alma Street, ASTON, BIRMINGHAM
Patentees and Manufacturers of High-class
METAL SPINNINGS IN ALL METALS
Patent Specialities in Metallic and Earthenware Sanitary Appliances, etc., for Railway Carriages, Ships' Cabins, etc.

STEELS
IN MODERN INDUSTRY
A Comprehensive Survey by 29 Specialist Contributors.
General Editor W. E. Benbow, late Editor of IRON & STEEL. Specifies the steels best used in various engineering applications (bearing in mind the present need for economy), describes their general and special properties and how they may be surface finished for anti-corrosive and other purposes. This work—the latest, most comprehensive and authoritative on the subject—comprises 562 pages with 260 illustrations, and has a foreword by Dr. H. J. Gough, C.B., M.B.E., M.I.MECH.E., F.R.S.

ASSOCIATED ILIFFE TECHNICAL BOOKS

42s. net. By post 43s. 9d.
Obtainable at all booksellers or direct by post from:
DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

"VORTEX" GAS BURNERS

. . . for metal melting

- *quickly and economically*
- *Heating and processing uniformly and accurately*

MODERN FURNACES and STOVES LIMITED

BOOTH STREET, BIRMINGHAM 21. phone: SMEthwick 1591-2

Rejects due to bad polishing?

Rubbish!

The boss was most emphatic. "Rubbish," he insisted. "These rejects are due to bad cleaning."

Good plating on a badly cleaned surface is like putting expensive wallpaper on bad plaster—they will both peel off in no time.

If your cleaners are right your rejects will disappear.

Get in touch with Cruickshank's. Ask them about

EXELCLEAN For hot cleaning of Steel, Brass, Copper, Britannia Metal, Tin and its alloys, Zinc and Aluminium.

CLEANIT A specially compounded Salt for Hot Alkali Cleaning of Steel, Brass, Zinc and Aluminium.

ALKLEAN A specially compounded Salt for cleaning Aluminium articles.

STIROCLEAN A balanced mixture of Chemical Salts for rapid, heavy duty cleaning of Iron and Steel components.

ROCOLENE An efficient Cold Cleaner Salt for final cleaning of Steel, Brass, Copper and Copper Nickel Alloys prior to plating.

CRUICKSHANKS

R. CRUICKSHANK LTD
CAMDEN STREET · BIRMINGHAM 1

'Phone: Central 8553 (6 lines)
'Grams: Cruickshank Birmingham

SM/C.2808

MAGNESIUM

you get more than a metal from

MEL

As sole producers of pure magnesium in Great Britain, and as the recognised authorities on every aspect of magnesium technology

we *offer* a complete service from design to production

we *sell* magnesium and its alloys

we *buy* magnesium scrap

Magnesium Elektron Limited

Clifton Junction Manchester Swinton 2511

London Office: 5 Charles II Street SW1 Trafalgar 1646

Magnesium Elektron, Inc., New York 20, USA

SERVICE
CIVILITY
SATISFACTION

We are second to none for our cash on collection buying of all
NON-FERROUS SCRAP METALS
Therefore when Selling Contact
FULL CASH SETTLEMENT ON COLLECTION

The
WOLVERHAMPTON TRADING & SCRAP CO. LTD
MARY ANN ST., WOLVERHAMPTON
PHONE: WOLVERHAMPTON 26017-8

NON-FERROUS METALS RESIDUES SCRAP

Brookside Metal Co., Ltd.
(OWNED BY METAL TRADERS LTD)
WATFORD FOUNDRY
BY-PASS ROAD, WATFORD, HERTS.
Tel: WATFORD 26474 (10 lines) *Telex London 28457*
Branch Works: **THAMES SIDE, READING, BERKS.**
Tel: Reading 54474/5

One of the Ole Timers
1888 1959
Buyers
OF ALL CLASSES OF NON-FERROUS SCRAP METALS—RESIDUALS
F.W.HARRIS (B'ham) LTD.
LION WORKS, CRADLEY HEATH, STAFFS.
TEL: CRADLEY HEATH 69281. GRAMS: HARRIS CRADLEY HEATH
Sellers & Specialists
OF ALL GRADED NON-FERROUS METALS

ORIGINAL & LARGEST MAKERS
of
EXTRUDED METALS
FASTEST MACHINING RODS IN THE WORLD • MOST RELIABLE BRONZE AND OTHER ALLOYS
REGISTERED TRADE MARKS
"DELTA," "DELTOID,"
"DIXTRUDO" & "DIXTAMPO"
The DELTA METAL CO. LTD.
LONDON & BIRMINGHAM

Consult

INTERNATIONAL REFINING CO., LTD.

for prices prior to disposal of your Non-Ferrous Metal Scrap and Residues, whether clean or irony.

Consult

Maryland Alloys Ltd.

for your requirements of Non-Ferrous Metal Ingots, whether of commercial or complex specifications.

Consult

Non-Ferrous Stockholders Ltd.

for your requirements of Sheets, Strips, Rods, Bars, Sections, in Aluminium and Alloys, Brass, etc., whether for immediate or long-term requirements.

HEAD OFFICE and WORKS

20/22 SUGAR HOUSE LANE, LONDON, E.15

Tel: MARyland 7771 (5 lines) LONDON TELEX No. 2-3314

BIRMINGHAM

LANCASTER COPPER WORKS, 87-95 LANCASTER ST., B'HAM, 4

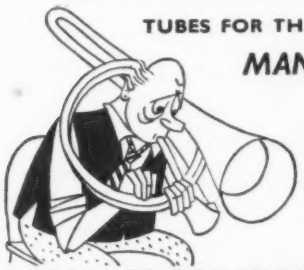
Tel: ASTon Cross 1982 P.B.X.

GLASGOW

400. GREAT WESTERN RD., GLASGOW, C.

Tel: WEStern 7344

TUBES FOR THIS—AND TUBES FOR THAT



MANUFACTURERS OF SMALL BRASS AND COPPER **TUBES**

ASTON TUBES (*NON-FERROUS*) LTD.

26/38 WAINWRIGHT STREET, BIRMINGHAM 6

Telegrams: "Astube B'ham 6" *Telephone:* EASt 0236

LONDON OFFICE, 179-181, Vauxhall Bridge Road, London, S.E.1. *Telephone:* Tate Gallery 8843

NORTHERN OFFICE, North Eastern Chambers, Station Square, Harrogate Telephone: Harrogate 67247

5721

H. BARNETT LTD.

VICTOR ROAD, LONDON, N.7.

SPECIALIZE IN

NON-FERROUS SCRAP METALS

Members of the National Association of Non-Ferrous Scrap Metal Merchants.

TEL: ARCHWAY 5461 (5 LINES)

For Good Sound

BUSHES & BLANKS

Specify

ESCO 'Rotocast' BRONZE

Sizes $3\frac{1}{2}$"—21" diameter in Phosphor Bronze, Lead Bronze or Gun Metal for Bushes or Worm Wheel blanks

THE EYRE SMELTING COMPANY LIMITED

TANDEM WORKS MERTON ABBEY LONDON SW19

Telephone: MITCHAM 2031

Also makers of TANDEM WHITE METALS & ESCO GUN METAL INGOTS etc.

All enquiries for ALUMINIUM should be sent to ALUMINIUM WORKS WILLOW LANE, MITCHAM, SURREY. Telephone: MITCHAM 2248

constructional steelwork shop practice

By John Farrell

This is a comprehensive, authoritative text-book of interest to all engaged in the constructional steelwork industry, but particularly valuable to apprentices and students. John Farrell, who was commissioned to write the text, has had a lengthy and varied experience on the practical side in every branch of the industry and was admirably qualified for the task. The book first describes the materials used in constructional steelwork and then goes on to discuss at length the reading of drawings of this type of work. The template shop, its equipment and its operations are considered, and the technique of setting-out is fully described.

Published for the British Constructional Steelwork Association

Contents include fabricating procedure, marking off, assembling, straightening, bending, cambering, punching, shearing, oxygen flame cutting, planing, scarfing, ending, grinding, drilling, riveting, metallic arc welding.

from leading booksellers **15s net by post 16s 1d size 8¼″×5½″ with 200 pp and 220 illustrations**

Published by Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1

ALUMINIUM Alloys

MADE TO ANY SPECIFICATION UNDER LABORATORY SUPERVISION

ON AIR BOARD LIST

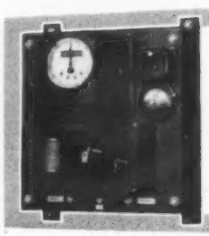
BRITISH INDUSTRIAL INGOT METALS LTD

Regd. Office: HICK ST., BIRMINGHAM
Phone: Calthorpe 1355-6

Licensed by Ministry of Aircraft Production, Light Metals Control

---

CANNING SILVER WEIGHT RECORDING *meter Panel*



Ensures correct deposit and prevents waste by overplating.

Gives warning and breaks circuit when required weight of silver is deposited.

Calibrated in pennyweight or in grammes.

Full details on leaflet No. 799B.

CANNING GREAT HAMPTON ST. BIRMINGHAM 18. LONDON & SHEFFIELD

ENTORES LIMITED

ORES, METALS *and* RESIDUES

City Wall House, 14-24 Finsbury Street, LONDON, E.C.2.

'Phone: MONarch 6050
Cables: ENTORES, LONDON
Telex No. LONDON 28455

THE THREADGILL ELECTRO DEPOSITS LTD.

THE THREADGILL BRAND

Manufacturers of

TINPLATES and ZINC SHEETS, BRASSED, COPPERED and NICKEL PLATED. Also CHROMIUM PLATED GUARANTEED NOT TO STRIP FLEXIBLE FOR DEEP DRAWING etc.

N.B. Users of THESE PRODUCTS will save by testing our SAMPLES which will be gladly sent on receipt of letter, or 'phone TIPTON 1151/2. PROMPT deliveries, GUARANTEED WORK and strictly competitive prices.

RELIANCE WORKS, UNION STREET, TIPTON, STAFFS

Rate: Advertisements set in run-on style 4d. per word, minimum 4/-. Semi-displayed announcements are charged at 22/6 per inch depth. Box Numbers: add 5 words, plus 1/- for registration and forwarding replies. "Copy" accepted at London Office up to 1st post on each Friday for the following Friday's issue.

METAL INDUSTRY
CLASSIFIED ADVERTISEMENTS

Trade Discounts: Details upon application to "Metal Industry," Dorset House, Stamford Street, London, S.E.1. Remittances payable to Iliffe & Sons Ltd. The proprietors retain the right to refuse or withdraw "copy" at their discretion and accept no responsibility for matters arising from clerical or printers' errors.

APPOINTMENTS VACANT

METALLURGICAL Chemist required in West Wales. Experience in non-ferrous essential. Submit age, details experience and salary required to Box 2971, c/o Metal Industry. [7755

BIRLEC Heating Division Sales Department want Furnace Design Engineer. Duties include discussions with customer and liaison with Engineering Department Designers and Estimators, and preparation of Project and Tender Specifications. H.N.C. or Engineering Degree standard. Apply to Personnel Manager (JMP), Birlec Limited, Tyburn Road, Birmingham, 24. [7757

METALLURGIST for Works Laboratory; required for ex-routine investigatory work. Experience in copper-base alloy castings and tube production preferred. Good prospects; 5-day week, pension scheme. Age limit 20-25. Applicants should state age, experience, qualifications (if any) and present salary to The Personnel Manager, The Birmingham Battery & Metal Co. Ltd., Selly Oak, Birmingham, 29. [7753

APPOINTMENTS WANTED

PLANT/Works Manager, 47, seeks post; 23 years experience hydrometallurgy, electrolytic refining, residue treatment, lead smelting and refining. Box 2972, c/o Metal Industry. [7756

CAPACITY AVAILABLE

SHEET Metal Work, Metal Spinning, Deep Drawn Pressings, Stamping Press capacity 200 tons. Max. draw 15". Enquiries or specifications to Wades (Halifax) Ltd., Arden Works, Fenton Road, Halifax. [0019

KELLERING and Cam Profiling Capacity up to 8 ft. × 6 ft., or 6 ft. diameter.
ARMYTAGE BROS. (KNOTTINGLEY) Ltd., The Foundry, Knottingley, Yorkshire. Tel. Knottingley 2743/4. [0001

HEAT TREATMENTS

HEAT Treatment. A.I.D. Approved, all wrought and cast Light Alloys. Large sizes a speciality. Electro Heat Treatments Ltd., Bull Lane, West Bromwich. Phone Wes 0756. [0005

MATERIALS WANTED

WANTED—New Aluminium Castings, excluding High Zinc Castings.
Clean Zinc Base Die-Castings.
New Cadmium Anodes.
New Nickel Anodes.
Offers to:—
FOUNDRY METALS LTD.,
41 BOROUGH ROAD,
KINGSTON-ON-THAMES, SURREY.
Telephone: Kin. 9745/1598. [7731

We can supply you with all your requirements of:

NON-FERROUS METALS, RODS, SHEETS, STRIPS, WIRES, TUBES & INGOTS.

Buyers of Non-Ferrous Metals in any form. Importers and Exporters.

STERLING PRODUCTS LTD.
Sterling Works, Leyborne Avenue, Ealing, London, W.13
Ealing 9248-9 & 0409. Cables: STERPRO, London

REGULAR BUYERS OF

NICKEL AND NICKEL ALLOYS
STAINLESS STEEL SCRAP AND TURNINGS
NICKEL STEEL BATTERIES
CAR RADIATORS

MITCHAM SMELTERS LTD.
Redhouse Road, CROYDON, Surrey
Telephone: THOrnton 6101 P.B.X.

PLANT FOR SALE

ONE Birlec 10 kW 4" Continuous Belt Conveyor Furnace, temperature 1,150°C., automatic temperature control
ONE Birlec 150 c.f.h. Town Gas Generator, for automatic control of above furnace. Can both be classified new, having had approximately one month's continuous work. Condition can be verified by manufacturers. £1,000. Box 2631, c/o Metal Industry. [7744

SCRAP METAL (SALE & WANTED)

NICKEL and High Nickel Content Scrap wanted. "Nimonics," "Inconel," "Monel," etc. Offer for best prices to Nicholson & Rhodes Ltd., Princess St., Sheffield, 4. Phone 27491. [0011

SCRAP METAL (SALE & WANTED)

B. J. PERRY & CO. LTD.
Exchange Buildings, Birmingham, 2,
for Phosphor Bronze Swarf and Scrap
and all Non-Ferrous Metals.
Tel.: Midland 5986-7. [0013

TIME RECORDERS

FACTORY Time Recorders. Rental Service. Phone Hop. 2239. Time Recorder Supply and Maintenance Co. Ltd., 157-159 Borough High Street, S.E.1. [0014

TUITION

BATTERSEA COLLEGE OF TECHNOLOGY
LONDON, S.W.11.

FULL-TIME and part-time courses in Crystallography, leading to the Internal M.Sc. degree of University of London or the Post-graduate Diploma of the College (by examination) will be held during the session 1959-60. A short part-time practical course is also available. Further particulars may be obtained from the Head of the Department of Metallurgy. [7754

BOOKS

GAS Welding and Cutting: A Practical Guide to the Best Techniques. By C. G. Bainbridge, M.I.Mech.E., M.Inst.W. A comprehensive textbook providing practical information on almost the whole range of available gas welding and cutting equipment, methods and processes. Invaluable to the practical welder as well as to those responsible for gas welding and cutting operations involved in the fabrication and repair of industrial equipment. Price 15s. net. By post 16s. 0d. From all booksellers or from The Publishing Dept., Dorset House, Stamford Street, London, S.E.1.

OXYGEN Cutting: A Comprehensive Study of Modern Practice in Manual and Machine Cutting. By E. Seymour Semper, M.I.Mech.E., M.Inst.W. Written to assist engineers concerned with cutting and shaping material, this book describes many of the machines designed for various applications of oxygen cutting to template with multiple heads and also the actual methods of operation. Price 10s. 6d. net. By post 11s. 4d. From all booksellers or from The Publishing Dept., Dorset House, Stamford Street, London, S.E.1.

MATERIAL Handling in Works Stores. 2nd Edition. By L. J. Hoefkens. Shows how the use of fork-lift trucks and pallets in industrial stores can increase production, utilize floor space more effectively, help control of movement and reduce costs. Includes a description of a system actually operated in a modern factory. 18s. 0d. net from all booksellers. By post 19s. 0d. from The Publishing Dept., Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED ADVERTISEMENTS

Use this Form for your Sales and Wants

To "Metal Industry" Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1. Waterloo 3333

PLEASE INSERT THE ADVERTISEMENT INDICATED ON FORM BELOW

- **RATE: 4d. PER WORD, MINIMUM 4/-.** Name and address to be included in charge if used in advertisement.
- **SEMI-DISPLAY: 22/6 PER INCH.**
- **BOX NUMBERS: If required 2/8 extra.**
- **PRESS DAY: 1st POST FRIDAY, for following Friday's issue.** Cheques, etc. payable to Iliffe & Sons Ltd. and crossed "& Co."

NAME.....

ADDRESS .....

.....

			REMITTANCE VALUE.....	ENCLOSED

Please write in block letters with ball pen or pencil.

NUMBER OF INSERTIONS.....

INDEX TO ADVERTISEMENTS

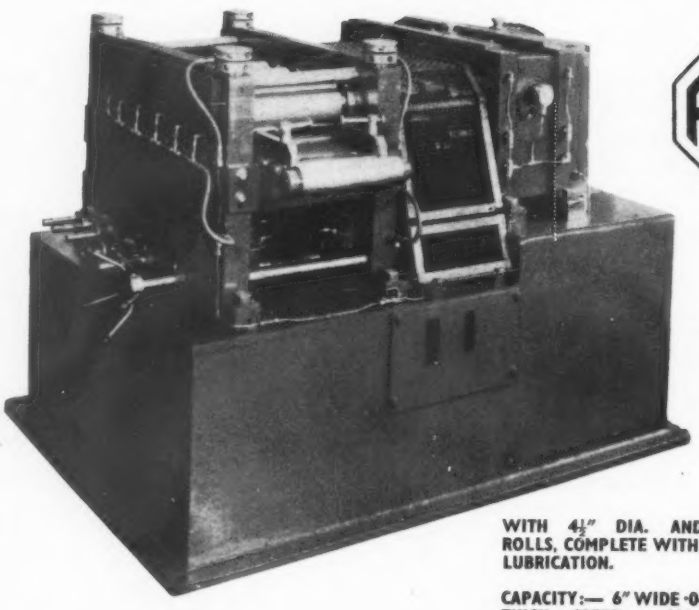
	Page
Alar Ltd.	Inside front cover
Aluminium Bronze Co. Ltd.	Inside back cover
Associated Pressings Ltd.	Inside front cover
Aston Tubes (Non-Ferrous) Ltd.	21
Auxiliary Rolling Machinery Ltd.	24
Barnett Ltd., H.	21
Birlec-Efco, Ltd.	14
Bolton & Sons Ltd., Thomas	12
British Industrial Ingot Metals Ltd.	22
Brookside Metal Co. Ltd.	20
Camelinat & Co. Ltd., E.	Outside front cover
Canning & Co. Ltd., W.	22
Carborundum Co. Ltd.	7
Chalmers & Co. Ltd.	Inside back cover
Chemical Construction (G.B.) Ltd.	1
Consolidated Zinc Corporation (Sales) Ltd.	16
Cruickshank Ltd., R.	19
Delta Metal Co. Ltd., The	20
Deutsch & Brenner Ltd.	18
Entores Ltd.	22
Eyre Smelting Co. Ltd	21
Fescol Ltd.	10
Firma-Chrome Ltd.	10
Frost Ltd., N. T.	24
Gibbons Bros. Ltd.	9
Great Bridge Foundry Co. Ltd.	12
Harris (B'ham) Ltd., F. W.	20
Harris Plating Works Ltd., The	10
Ilfar Aluminium Co. Ltd.	10
International Alloys Ltd.	2
International Refining Co. Ltd.	21
Levick Ltd., John	18
McKechnie Bros. Ltd.	Outside back cover
Magnesium Elektron	19
Metal Industry Handbook	13
Milner (Metals) Ltd., A. E.	18
Mitcham Smelters Ltd.	23
Modern Furnaces & Stoves Ltd.	19
Monometer Manufacturing Co. Ltd.	Inside front cover
Robertson & Co. Ltd., W. H. A.	3
Rolsan Engineering Ltd.	8
Roper & Co. Ltd., E. A.	Inside back cover
Senier & Co. Ltd., T. W.	8
Shardal Castings Ltd.	24
Sheffield Smelting Co. Ltd.	11
Silvercrown Ltd.	17
Simpson (Assayer) Ltd., Gordon	10
Stedall & Co. Ltd.	18
Sterling Products Ltd	23
Strebor Diecasting Co. Ltd.	6
Stuart (London) Ltd., Robert	10
Tame Valley Alloys Ltd.	13
Thermal Syndicate Ltd., The	4
Threadgill Electro Deposits Ltd.	22
Ward Ltd., Thos. W.	5
Wolverhampton Trading & Scrap Co. Ltd.	20

N.T. FROST LTD.
ELECTROPLATERS
THE SPECIALIST ELECTROPLATERS OF SMALL WORK IN QUANTITIES
FULLY APPROVED A.I.D.
ALL FINISHES
HARFORD ST. BIRMINGHAM 19 Tel. CEN 4135 (6 lines)

SHARDAL CASTINGS LTD
Buyers of Non-Ferrous Scrap Metals
LOWER TRINITY STREET, BIRMINGHAM. 9.
Telephone: VIC 3551/2

AUXILIARY ROLLING MACHINERY LTD—TIPTON 2617/18/19

INCREASE PRODUCTION BY USING LATEST DESIGN OF AUXILIARY MACHINERY



ARM

WITH 4½" DIA. AND 3" DIA. ROLLS, COMPLETE WITH AUTOMATIC LUBRICATION.

CAPACITY:— 6" WIDE ·040" TO ·375" THICK. SPEED:— 100 FEET PER MINUTE.

12 ROLL FLATTENING MACHINE

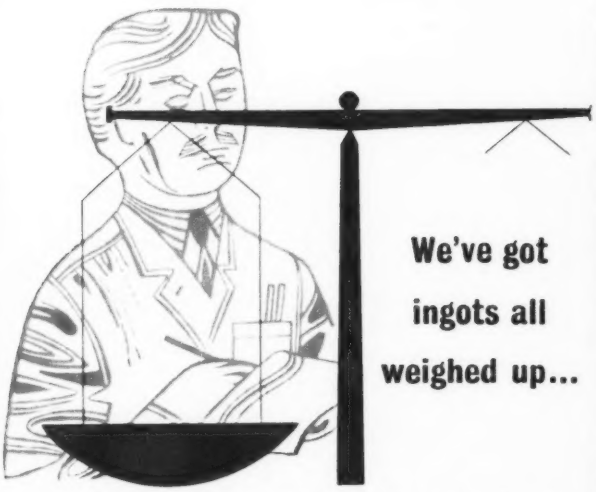
Printed in Great Britain by James Cond Ltd., Charlotte Street, Birmingham, 3. Published by Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

FOR *Diecastings as strong as steel*

ALUMINIUM BRONZE CO. LTD.

Wallows Lane · Walsall · Staffs.

Telephone: WALSALL 2108 (3 lines)
Telegrams: "ABCO WALSALL"



We've got ingots all weighed up...

.... and have had for some time judging by the number of repeat orders simply asking for "same as before." We've long recognised the importance of consistency and — by taking great pains in every stage of production, make up, and analysis of each order — we believe we've ensured standards of the highest uniformity

It is all part of the policy which keeps us in the forefront of ingot metal manufacturers.

Chalmers *make sound* ingots

E. CHALMERS & COMPANY LIMITED
Newhaven Rd., Leith, Edinburgh, Scotland

Telegrams & Cables "GILES" Edinburgh Telex
Telex 72-232
Telephones: 36611 (5 lines)

The **Roper** **GEARED LADLE HOIST**

- **INCREASES PRODUCTION** Faster and safer metal handling
- **SAVES LABOUR** by one-man operating throughout
- **MAXIMUM EFFICIENCY** from specially designed Crucible Carrier or Ladles

View showing moulds being poured on Conveyor from 'Roper' Hoist, with Lifting Bail and Crucible Carrier. Bail fitted with side and top protection plates.

Photograph published by courtesy of Messrs. Harvey & Longstaffe Ltd., Manchester 4

Price and full particulars on request.

E. A. ROPER & CO. LTD.

FOUNDRY ENGINEERS, KEIGHLEY, YORKSHIRE.
Tel: Keighley 4215/6 *Grams: Climax, Keighley*

Secret Formula ?

No, it simply means that McKechnie have the answer to every production need. Whether extruded sections in brass, bronze, nickel silver or copper from over 20,000 dies available, or brass rods in straight lengths or coils for high speed turning and screwing, it is the consistently high quality and faultless finish of McKechnie products that has made them the choice of Industry throughout the world.

Mc KECHNIE

HIGH QUALITY

EXTRUDED SECTIONS and BRASS RODS for Industry

McKECHNIE BROTHERS LIMITED 14 Berkeley Street, London, W.1. Telephone: Hyde Park 9841/7.
Metal Works: Rotton Park Street, Birmingham 16 and Aldridge, Staffs. *Other Factories at* Widnes, London, South Africa, New Zealand.
Branch Offices at London, Manchester, Leeds, Gloucester, Newcastle-upon-Tyne, Glasgow (Agents J. Hood & Co.), Paris.